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UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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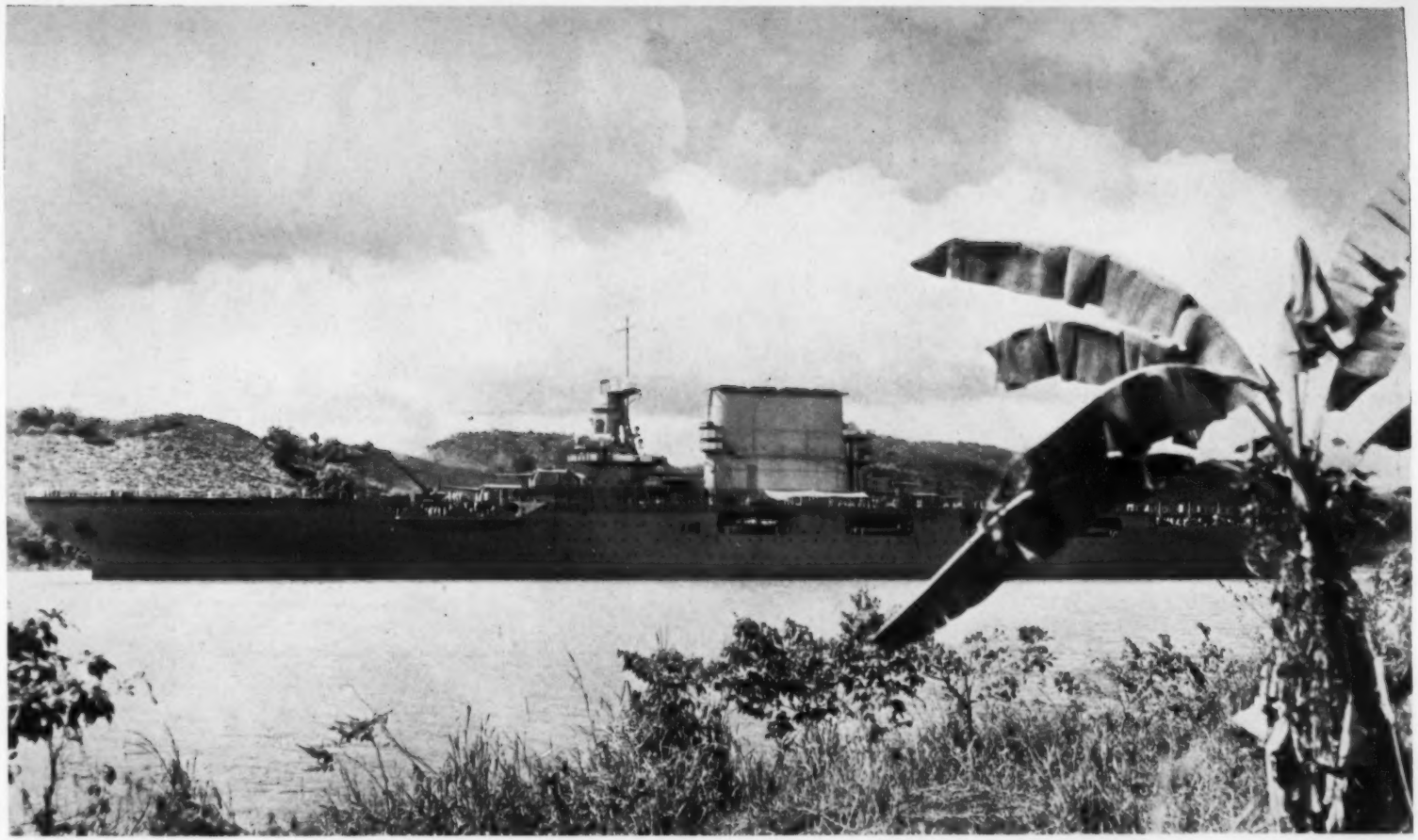
BY THE DAWN'S EARLY LIGHT

Courtesy Bureau of Aëronautics, Navy Department

U. S. S. *SARATOGA* IN CULEBRA CUT, PANAMA CANAL

U. S. S. *SARATOGA* IN CULEBRA CUT, PANAMA CANAL



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A FLYING FIELD MOVES FROM THE ATLANTIC TO THE PACIFIC WHEN THE U. S. S. *SARATOGA* TRANSITS THE PANAMA CANAL

International Newsreel

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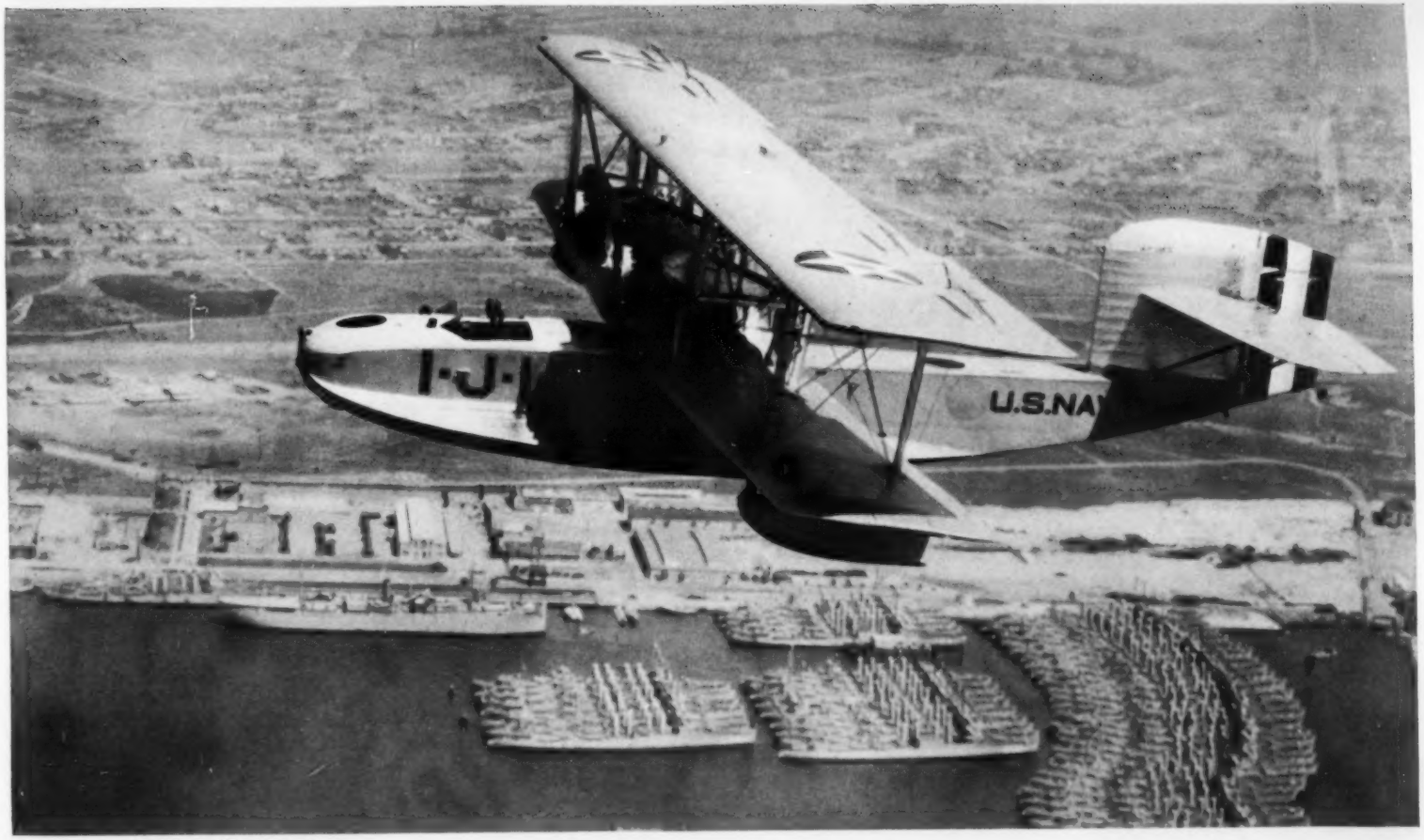
Six British airmen make simultaneous parachute jumps at Henlow Aërodrome



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Commander Aircraft Squadrons, Battle Fleet, inspects the crew of the U. S. S. *Lexington*

Commander Aircraft Squadrons, Battle Fleet, inspects the crew of the U. S. S. *Lexington*

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WASHING DOWN A FLYING FIELD

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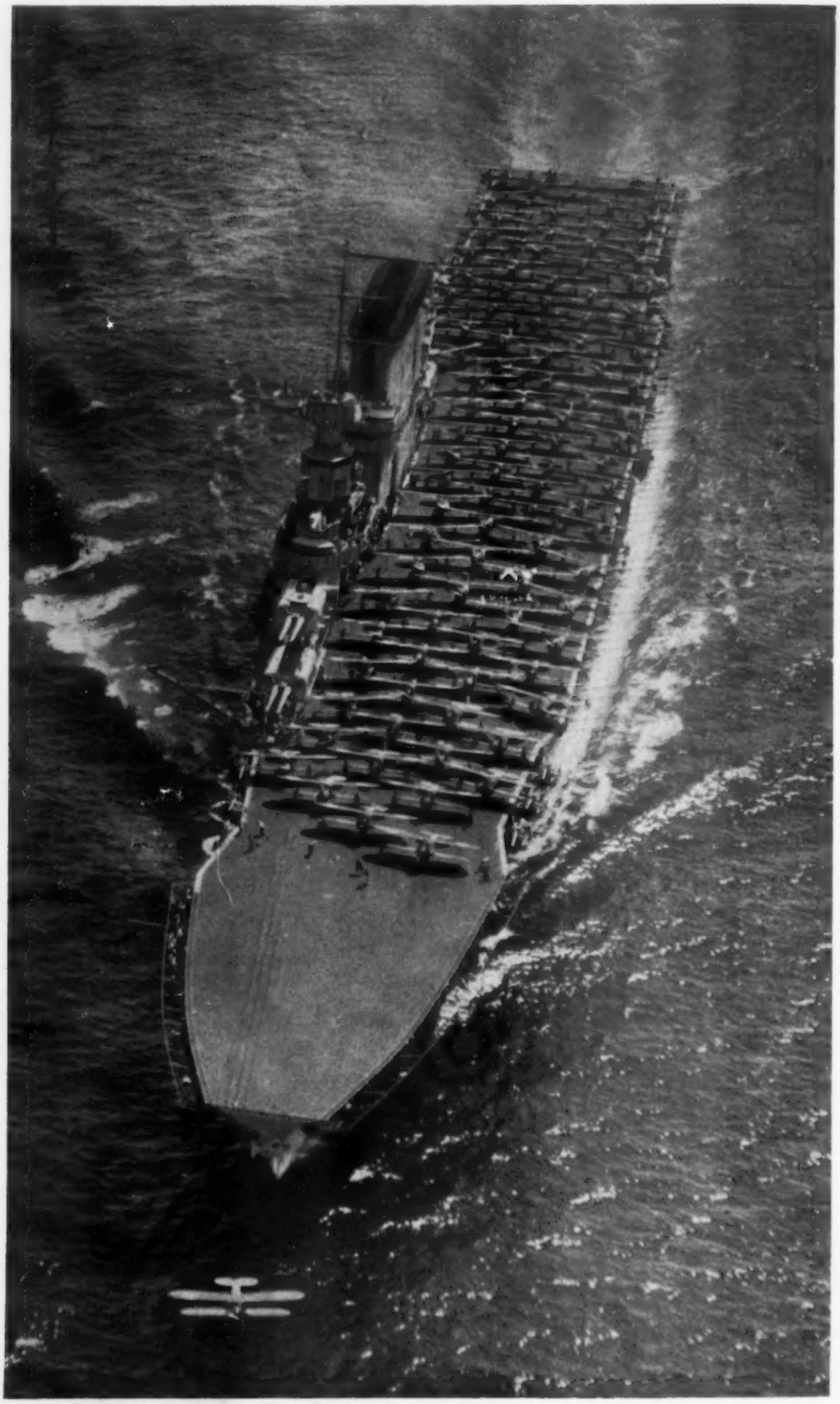
PLANE TAKING OFF OF U. S. S. *SARATOGA*



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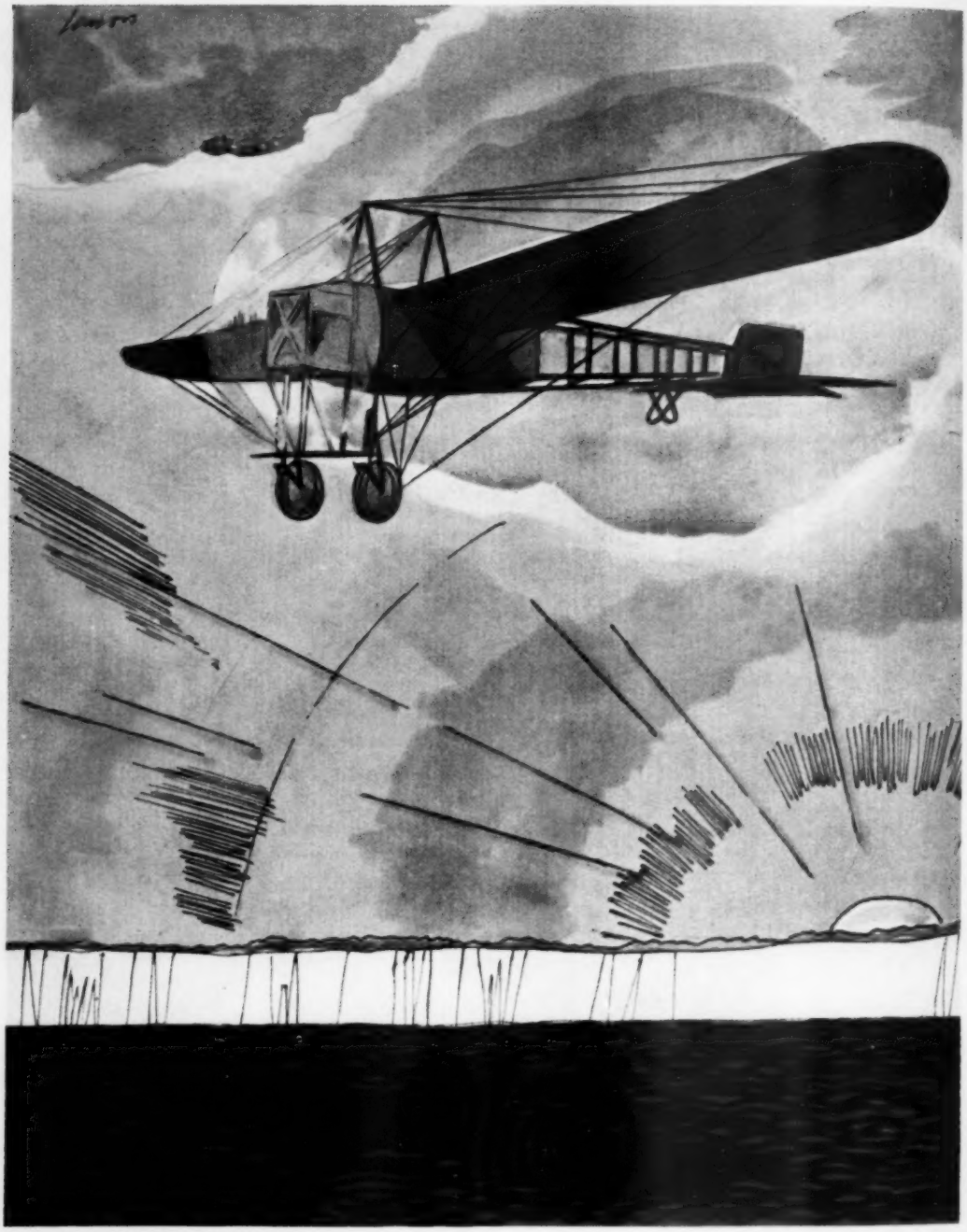
THE EAGLES' LAIR

Planes on deck of U. S. S. *Saratoga* taking to the air



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Louis Blériot Passes the White Cliffs of Dover in May, 1909

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The Readjustment *to* New Weapons

By LIEUTENANT FRANKLIN G. PERCIVAL, *U. S. Navy (Retired)*

Naval tactics are based upon conditions, the chief causes of which, namely the arms, may change; which in turn causes necessarily a change in the construction of ships, in the manner of handling them, and so finally in the disposition and handling of fleets.
—MOROGUES

JUTLAND, with its clear-cut lessons, looms so large in naval minds that, so far as the weapons then employed are concerned, we may expect to see an approximate uniformity in the tactics and ship designs of the leading naval powers. New weapons, their employment and the defense against them, consequently form the most promising field for study. Head and shoulders above them all stands the airplane. Since many others have discussed its potentialities, limitations, and tactics, this paper will be devoted to a consideration of the inevitable readjustment. In discussing this problem, we can deal incidentally with other new or augmented menaces: the fleet submarine, gas, coastal motor boats, mines, and plunging fire.

STRATEGY AND TACTICS

Perhaps the greatest strategical change is that the bomber, torpedo plane, and aërial scout strengthen the forces of coast defense. This, however, only accentuates a trend that has been apparent for some time. The bigger gun, the extended use of mines, the submarine, and the coastal motor boat had already reënforced the strategic defensive. Has not the airplane added to this strength to such an extent that a commander assuming the offensive automatically places himself at a serious disadvantage? In other words, just as the advent in armies of the machine gun, without any corresponding increase in the *defensive* strength of the infantryman, made the *offensive* impracticable, have not the improvements in weapons—particularly those operated from or near shore—so far outstripped the defensive strength of ships that fleets will not dare approach hostile shores? You cannot take the offensive by staying in port, or even by steaming majestically about in mid-ocean.

The same thing applies to the tactical offensive. If there is one outstanding lesson to be drawn from Jutland, it is the tactical value, or rather, the absolute necessity of defensive strength.

The point we wish to make is that *the offensive cannot be sustained unless accompanied by an adequate defensive.* The defensive strength which the tank possessed and the infantryman lacked was what made the *offensive* practicable for one and impracticable for the other. At sea, it was the same story. The Grand Fleet had a marked preponderance in all of the traditional elements of offensive strength—speed, bigger guns, and overwhelming numbers. Yet at Jutland, Jellicoe's lack of confidence in the underwater protection of his battleships was primarily responsible for his cautious tactics. It is noteworthy that three of Beatty's battle cruisers were sunk because of their de-

ficient resisting power; whereas the stout protection of Hipper's battle cruisers enabled them to be flung at the entire Grand Fleet without disaster. It was the absence of any defense against the submarine which compelled Jellicoe to withdraw to Lough Swilly at a critical stage of the war. Had the conflict been prolonged into 1919, the submarine's lack of a defense against mines would probably have ended its offensive operations. Although the offensive power of Zeppelins had steadily increased, their want of defensive strength against new weapons put a stop to their raids in 1918. Does not this establish our point that, when the defensive lags much behind the weapons which must be encountered, the offensive becomes impracticable?

Defensive strength is not an end in itself, but it is an absolutely vital means to the desired end. Big guns, powerful engines, and skilled personnel are of no value at the bottom of the sea; they must be accompanied by the necessary defensive strength to keep them afloat in order that they may exert their offensive power. The ships that stay afloat and keep on hitting are the ships that count.

The possession of a fleet capable of a successful offensive is of particular importance to the United States. If, for example, our weakly held Philippines should be taken from us by a "bolt from the blue," we should require some time to organize a force to retake them. In the meantime the invaders would have time to consolidate their position. With our fleet as constituted at present, their recapture would be a very grave undertaking. Yet, manifestly, it is a task for which our fleet should be adequate. We have, moreover, other outlying possessions and a long coast line to defend. This could best be done by taking the offensive. Since such strategy is also the direct path to control of the seas—the aim of every naval power in war—all our requirements are met if we succeed in building and training a fleet capable of a successful offensive.

Our problem is, then: how are we to build up our defensive strength to the point where we can assume the offensive without undue risks? Should we not profit by the dearly bought experience of armies in the late war? The offensive became impracticable for them because, although the infantryman had all of his old-time striking power and mobility, he had no defense against the bullets of the machine gun. They overcame this disability, partly by changes in tactics, partly by a greatly extended use of artillery to defend the advancing infantry, and partly by the use of tanks. Can we not solve our problem by new tactics, by extending the use of defensive gunfire, by increasing the protection of individual ships and by adopting special defensive types?

For the sake of brevity, it is proposed to lay down certain generally accepted premises on which to base further discussion.

1. The airplane is essentially an offensive weapon.

2. If we attempt to use our planes defensively, they will not only fail to defend the fleet, but will probably be destroyed in detail.

3. The logical primary objectives for the opposing air forces are each other's carriers.

4. The ideal attack is one which destroys the hostile carriers, while their planes are still aboard. Hence, it must be launched at the earliest possible moment.

5. The enemy air force will observe the principle of concentration of forces and launch the majority of its planes in a simultaneous attack, calculated to reach home by sheer weight of numbers.

6. An air force, *if unopposed*, could inflict serious, possibly fatal, damage upon a fleet. An *adequate* defense must, therefore, be provided against aircraft.

7. Aside from the defense afforded by the offensive operations of our planes, the gun is the most powerful weapon so far produced for this purpose.

If we accept these premises, several obvious conclusions follow. First of all, the battleship, which represents the highest development of the floating, mobile gun platform, will constitute the backbone of our aërial defense. It is also apparent that, since the composition of any ship's battery should be decided by the relative effectiveness of the weapons which may be brought to bear on that ship, the increased potency of aircraft calls for corresponding increases in antiaircraft batteries. Another conclusion is that the gun defense against aircraft will require a tremendous expenditure of ammunition. Previous ideas on ammunition allowances will have to be entirely recast. Finally, while the basis of our gun defense will probably be a system of zone

fire, we must be able to fire in any direction without worrying too much about where the shrapnel will fall. This means that all personnel on all ships must be housed in shelters which are, at least, shrapnel-proof. The danger from the machine-gun bullets of attack planes further reënforces this requirement.

Another change is that the torpedo and bombing planes of the carriers constitute a striking force of great power and of speed incomparably higher than anything seen heretofore. Their attacks will not only be delivered with amazing swiftness, but can be concentrated at any desired point within the radius of the planes. Entirely new vistas are opened up in applying the principle of the concentration of forces. Isolated units of the fleet will be pounced upon and annihilated as a hawk swoops down upon a stray duckling. For example, would not cruisers, strung out in an advance screen several hundred miles ahead of the main body, constitute an ideal objective for a concentrated air attack? They would be too far apart for mutual support against such a swiftly materializing onslaught and could not hope to run away from it. In fact, the more they have sacrificed armament and protection to gain speed, the more easily they will be sunk. Do not these considerations necessitate the substitution of submarines for cruisers in the advance screen or for any detached duty in waters where large hostile air forces may be encountered? The ability to submerge would be the only hope of escaping an aërial attack in overwhelming force. Their position in the advance screen would, moreover, give them an excellent chance of striking an unexpected blow at the enemy main body.

Not only must all surface units of the fleet usually be kept concentrated when in hostile waters, but the cruising and approach formations of the fleet deserve special study. Vessels must be close enough together for mutual support, but not so close as to form a reasonably good mass target for bombers. A surface screen will be unnecessary while our planes are able to take the air; in fact, our air force would ask for no more tempting targets than a group of cruisers feeling its way toward our main body. Yet, in darkness or nonflying weather, a surface screen must be quickly thrown out, but only to such distance that it can be speedily recalled. If we succeed in developing an adequate aërial defense for the fleet as a whole, the tendency of the hostile air force will be to nibble at its "fringes." Consequently, the antiaircraft batteries and tactical disposition of our light forces demand particular attention.

Increased effectiveness will be seen in control operations. Airships patrolling hundreds of miles offshore will add greatly to the hazards of coastal raids. The presence of aircraft carriers with hunting squadrons will increase not only their range of vision but their range of striking. The great speed of their planes will enable them to attack promptly anything sighted, without a long stern chase, heretofore so frequently broken off by nightfall. This means that control of the sea will be more nearly absolute, and hence the value of sea power will be greater than ever. In other words, air power, instead of superseding sea power, merely adds to its effectiveness.

The development of aërial scouting means that contact will usually be established at much greater distances than formerly. High speed will seldom be needed to avoid other surface vessels and will be useless for avoiding aërial attacks. Effective aërial scouting, strong antiaircraft batteries, and protection will add more to the safety of isolated units than will extreme mobility.

It is noteworthy that speed, within the limits ordinarily considered for any given type, is of relatively little value against the new weapons, either offensively or defensively. Furthermore, the late war sharply deflated the estimated importance of that quality. We have also just noted its reduced value for either pursuit or escape. This suggests that we reduce speed in all types of ships in order to make the needed additions to protection, defensive armaments, and ammunition allowances.

The Battleship

In discussing this and other types, their offensive characteristics will not be dwelt upon. Their importance is clearly realized, but our present problem is how to build up defensive strength. This we will try to do with a minimum of interference with offensive potentialities.

The consensus of opinion seems to be that the present 5-inch gun, or one much like it,

will form the backbone of our aërial defense; our principal problem is how to keep it in action during a battle. Since control of the air is never likely to be absolute, and the attacks will develop with amazing swiftness, the men must manifestly remain at the guns. If they are left to stand in the open, they will be annihilated early in the action. Their chances of staying in the fight would be greatly improved if we grouped them in turrets, protected by three or four inches of armor.

The advantages of such a course are:

1. The effective arc of fire of the guns will be increased.

2. The personnel will be protected against direct hits by small bombs and secondary-battery shells, against splinters of large shells, against the blast, splinters and flying wreckage of bomb explosions, against the gunfire of attack planes, against gun blast, falling shrapnel, weather, and the quantities of water falling on the deck in battle. In short, it protects them against everything except direct hits by large shells and bombs.

3. Similar protection will be afforded gun mounts and foundations, vital communication and power cables, ready ammunition and ammunition hoists.

4. It not only provides more protection for less weight than the old armored casemates, but does not have the disadvantage of covering a large area with thin armor which brings shells to detonation that might otherwise pass on through. In other words, it protects only the area which needs to be protected, and detonates only those shells which would in any case have struck the guns, mounts, foundations, or hoists.

5. The collective target offered by guns in turrets is smaller than that of the same number of guns in broadside.

6. The overhang of the turrets will form armored stations for the fire-control parties.

7. Fewer men per gun will be required, thus reducing congestion in living spaces and cost of upkeep.

8. It will be beneficial to morale and efficiency to eliminate as many of the hazards as possible. Aside from humanitarian considerations, the importance of keeping these guns in action throughout the battle cannot be overestimated.

If we agree that the foregoing reasons are sufficiently weighty to justify the housing of the antiaircraft battery in turrets, let us consider the torpedo-defense battery. It is likely that destroyers making daylight attacks will avail themseves of the protection of a smoke screen, whenever possible. The important point is that airplanes have greatly facilitated the use of smoke. Consequently, the menace of a strong destroyer attack behind a smoke screen is much greater than formerly. So far as the battleships alone are concerned, the best defense is probably barrage fire controlled by aircraft. This, to be effective, entails an increase in the number of guns. When it comes to their disposition, it is obvious that the same excellent reasons exist for housing them in turrets. We now see that, not only are we using up too much tonnage for these batteries, but that so many turrets cannot be grouped without mutual interference.

The logical conclusion is that these two batteries must be combined, using the long 5-inch gun with reduced charges when firing shrapnel and full charges when firing common shell. The proposed combination somewhat complicates the ammunition supply; but the problem of quickly shifting from one kind to another is one that must be solved in any case, since we already have common and star shells besides shrapnel, and will probably have gas shells in the future.

There are, moreover, other reasons for this combination. First of all, it would accord with the basic principle of the concentration of forces. It is of the greatest importance to be able to concentrate all guns of this caliber either on a destroyer attack or to meet the enemy's big air attack. The morale of gun crews, moreover, will be better if busy than if idle. The separation of antiaircraft and torpedo-defense batteries represents duplication of effort and useless weight, adds to the cost of maintenance of individual ships and results in overcrowded living spaces. Finally, a strong battery of guns of this size, mounted in turrets and capable of high elevation, would be of inestimable value in combined operations. Since we are potentially the world's greatest amphibious power, this point is of special interest to us.

How many such guns should be mounted? Due to the fact that they require proportionally more space abaft the breech than

large guns, it would probably be found economical of armor weight to mount them in quadruple turrets. This would also enable better advantage to be taken of the limited number of good gun positions. Although the exact number should be determined by a series of experiments, we discover by making tentative sketches that six or seven such turrets is the maximum number that can be mounted without mutual interference. Each gun should have separate elevation.

There are, however, other complications to be considered. In the first place, it is apparent that we will require a tremendous amount of ammunition. Consequently, we should use smaller guns with lighter projectiles, whenever possible. We must also be able to meet simultaneous attacks by large numbers of destroyers and torpedo planes. The former would require the attention of all of our 5-inch guns that would bear. This battery clearly must be supplemented by a weapon capable of dealing with the latter. Coastal motor boats constitute an additional menace. If one emerges from a smoke screen 1,000 yards away, or is suddenly made out in the darkness at the same distance, we obviously will have no time for range-taking or fuse-setting. We must have some weapon that needs simply to be pointed in the general direction of the approaching boat and whose fire will be instantly annihilating. A similar defense is required against a bombing or attack plane diving out of a low hanging cloud, or a torpedo plane emerging from a smoke screen close at hand. The same thing applies to night attacks by planes. We must also be able to shoot down *quickly* any plane attempting to lay a smoke screen in the vicinity of the battle line. In dealing with these swiftly moving targets, the time element is absolutely vital.

The solution proposed for this problem is to provide an additional battery of approximately one hundred 37-mm automatic guns, mounted in small turrets, protected by three to four inches of armor. There would be from nine to twenty-five guns in a turret, depending upon the position. These turrets, due to their smaller size and lighter weight, could be located in places not suitable for the larger ones. Within the turrets, the guns would be arranged in three to five tiers, slightly divergent in the vertical plane. There would be three to five guns, slightly divergent in the horizontal plane, in each tier. All guns in a turret would train and elevate together. Thus each turret would deliver a divergent stream of projectiles which would mean instant destruction for any plane or boat within its limits. Besides meeting the foregoing requirements, it would be very effective against any planes approaching at altitudes less than 10,000 feet, as well as against the periscopes of approaching submarines.

It is further proposed that the main battery be provided with at least eighty degrees elevation and approximately ten rounds per gun of shrapnel. This would probably necessitate a different face plate, port opening, and elevating gear, but the difficulties should not be insuperable. It is not advocated that we start blazing away with 16-inch shrapnel every time a hostile plane appears; the idea is to conform to the principle of the concentration of forces by allowing these guns and crews to do their bit of smashing the enemy's big air attack. Our aim should be, not merely to repel this onslaught, but to annihilate the attacking force. This would not only definitely eliminate those planes from further part in the action, but would tend to shatter enemy morale. The crucial part of the attack would last only a very few minutes; it might be measured in seconds. An air attack is incomparably swifter than anything navies have heretofore encountered. A few well-directed rounds during the critical moments would be all that is required from the main battery. Reduced charges could be used so that the wear on the guns would be trifling. When we recall that a single burst of 15-inch shrapnel from the *Queen Elizabeth* wiped out an entire company of Turks at the Dardanelles, it is obvious that a salvo of eight or nine simultaneous bursts of 16-inch shrapnel would spread destruction over a wide area. Multiply this by the number of battleships present, and it will be realized that we cannot afford to allow these powerful guns to remain idle during the decisive moments of the air attack.

There are, moreover, other advantages of this proposition. One of great importance is the value of high-angle fire in bombarding shore positions. The limited elevation of the guns of the *Queen Elizabeth* proved a decided handicap at the Dardanelles.

These large guns would also give us a weapon to use against airships or planes at extreme altitudes. We should not forget that we are discussing the characteristics of ships which must meet, not the air forces of today, but of the period 1935-1955. Greatly improved performance of airships and planes must be allowed for. It is also entirely possible that the Chemical Warfare Service may find some effective way of coping with the aërial menace. Ten years from now, we may be using our big guns, with reduced charges, to lob huge gas shells up among the attacking planes. Finally, there is no denying that, when our earlier dreadnoughts were designed, the elevation of their guns was not only ample to meet existing conditions, but it provided a wide margin for future developments. Nobody foresaw the use of the spotting plane. Yet, before these ships were ten years old, we were lamenting the inadequate elevation of their guns. If we go the limit and provide eighty-degree elevation for all guns on future ships, we will never again be placed in such a position, regardless of what contingencies may arise—and *much* may happen in the next twenty-five years.

A noteworthy feature of this system of gun defense is that the protection is proportional to the danger. Since the bomber's chances of scoring a hit vary almost inversely as his height above the target, we have provided a gun defense that is practically invincible up to 10,000 feet, highly effective from there on up to the maximum range of the 5-inch battery and, even above that, we still have our big guns which could be used if necessary. The same thing applies in the horizontal plane as to protection against torpedo planes or coastal motor boats.

There are certain other defensive measures which require no amplification. Sound-locating gear should be supplied to detect the approach of planes at night or behind smoke screens or low-hanging clouds. The development of chemical warfare, besides the well-known defensive measures, has made more urgent the discovery of a non-chemical-absorbing material for covering weather decks. It is also manifest that thicker protective decks are required to meet the menace of plunging fire and large bombs. The latter also necessitate better underwater protection, a requirement reenforced by probable increases in the size of torpedoes and the development of the fleet submarine.

The difficulty of meeting all the requirements would be increased by any reduction in the maximum tonnage of battleships and our attempt to restore the balance between the offensive and defensive strength of the fleet would be defeated. A reduction in the maximum caliber of guns would not help much, as the bomb menace would prevent a corresponding cut in armor weight. We are, moreover, proposing to use our big guns defensively.

Battle Cruisers

The airplane has, to a great extent, supplanted this type in the getting of information and as a high-speed striking force. Furthermore, the nature of battle cruiser duties requires that they take a somewhat exposed position. Consequently, their need for protection and for a strong defensive battery is even greater than that of the battleships. Yet they must have a speed approximately 25 per cent greater than the latter. Such speed can be obtained only at the expense of armament and protection, both of which are badly needed, not only for the effectiveness of the individual ships, but for building up the defensive strength of the fleet as a whole. Furthermore, the Washington Treaty, by limiting the number of capital ships which we may build, makes the question not whether battle cruisers are desirable, but whether they are worth as much to us as battleships. In view of the decreased usefulness of the former and the necessity for adding to the defensive strength of the fleet, we conclude that, under existing conditions, battleships represent a sounder investment.

Aircraft Carriers

The provision of an adequate defense for these vessels constitutes a special problem, since they will unquestionably be the objectives of concentrated attacks and are handicapped to an unusual degree in defending themselves. While launching and receiving planes, they not only present a large and steady target to bombs, torpedoes and gunfire, but are unable to use their own guns freely in reply. Furthermore, gasoline and large unarmored uptakes add considerably to the fire hazard, and their flying

decks and cargo of planes are inevitably highly vulnerable.

They must manifestly be kept in a sheltered position and protected by other vessels. Until the fleets have deployed and the opposing battle lines are engaged, formations can be adopted which insure adequate defense for the carriers. Our principal problem is how to defend them after our battleships are engaged with the hostile fleet. It is proposed to do this by protecting an area on the unengaged beam of our battleships. These vessels, with accompanying light forces, would guard one side and the adjacent corners. The remaining boundaries would be protected by a screen of special defensive cruisers and defensive destroyers, whose characteristics will be discussed later. This screen would afford absolute protection against hostile surface vessels and, if the enemy's big air attack has been crushed, it could probably deal with such minor attacks as he might launch.

Although the foregoing is not an ideal defense, the only alternative is to provide none and try to conceal our carriers. Such a course has the following disadvantages: in view of the speed, range of vision, and cruising radius of scouting planes, carriers could not be concealed in any position from which their planes could be effectively employed; they will be discovered, made the objective of concentrated attacks and, for lack of an adequate defense, inevitably destroyed; on the other hand, if kept with the main body, they could be provided with an almost invulnerable defense during the critical phase of the aërial conflict, and a reasonably adequate defense throughout the battle; if kept at a distance from the main body, planes would not only waste valuable time in flying back and forth, but must carry more gasoline and consequently fewer bombs. In view of the fact that the airplane is essentially an offensive weapon, we conclude that the soundest solution is to keep the carriers with the main body where their planes can be most effectively employed and take strenuous measures for their protection. The importance of defending these ships is great enough to warrant radical changes in the composition and tactics of the fleet.

We will now return to the carriers themselves. Since they are so handicapped in the use of their guns and since we are providing a surface screen for their protection, it would probably be advisable to leave off their 8-inch battery and use the weight saved to provide an additional flying deck and stowage space for reserve planes. Their batteries would consist of 5-inch and 37-mm guns mounted in turrets, as many as can be carried without interfering with the major mission of the carrier. The principal problem is the development of a gun defense that can be utilized while launching and receiving planes. Possibly the 50-caliber machine guns could be worked in advantageously on these ships where blast interference is of such great importance.

They must also be given some passive protection, partly because of the impossibility of replacing one of these invaluable vessels during the course of an ordinary war, and partly because of the fallibility of any system of defense against concentrated attacks. Hence, it is proposed that they be built with a protective deck, proof against medium-size shells or bombs and with underwater protection capable of taking care of at least two hits by torpedoes of present size. If we may judge from the bombing experiments conducted with the *Frankfurt*, this degree of protection would suffice to keep them afloat in spite of severe punishment. The provision of multiple flying decks would not only afford protection to planes on the lower or flying-off deck against falling shrapnel and bullets, but would enable flying-on and flying-off to be carried on simultaneously. Wooden weather decks constitute an additional hazard which must be eliminated. These proposals would probably necessitate a displacement of around 17,250 tons; but would it not be better to accept a cut in numbers, in order to have the backbone of our carrier fleet composed of vessels able to survive a hard-fought battle? These should be supplemented by unarmored carriers of 10,000 tons.

Cruisers

The necessity for protecting aircraft carriers during a fleet action has already been mentioned. Besides this, we must have a screen of defensive cruisers immediately surrounding the fleet, when in cruising formation, as well as escorting cruisers to protect convoys. There is, moreover, urgent need for an additional type having sufficient protection and volume of antiaircraft fire to build up the defensive against air-

craft to the point where we can be sure of annihilating the first big onslaught of the enemy air force, as well as to permit the fleet to approach hostile shores without prohibitive risks.

The distinctive feature of these defensive duties is that they do not require high speed, but do require the maximum of gun power and protection. The latter qualities can be obtained at the expense of the former. The usual objection to building slow cruisers would not apply; because, when with the fleet, they would always have battleships in close support and, when escorting convoys, they could not, in decency, run away. We must ask ourselves the question: so far as these defensive cruiser functions are concerned, should it be our aim to provide the maximum of defensive strength on the allowed displacement, or to provide the capacity for headlong flight? We cannot obtain both. There is only one answer. Here is a clear-cut case for a distinct type of cruiser. It would manifestly waste precious tonnage to build ships for this duty with high speed which they do not need, but lacking the gun power and protection upon which their usefulness and very existence depend.

Let us see what characteristics are possible. In the PROCEEDINGS for September, 1926, Commander H. S. Howard (CC), U. S. Navy, discussed 10,000-ton cruisers with 8-inch guns as follows:

> If protection is considered important, it can be given by the sacrifice of speed. We can run down from a type with a speed around thirty-two knots and protection sufficient to keep out the attack of the guns of a destroyer, to a type with a speed of twenty-six or twenty-seven knots, and armor sufficient to meet the attacks of similar ships, that is, a small fast battleship. Up and down this scale the battery will not vary greatly so long as four center-line gun positions are held.

The latter type is approximately what we want, although it would suit our purpose better to cut the speed to twenty-five knots and provide a strong defensive battery of three triple 5-inch turrets and four nonuple 37-mm turrets. If the speed of battleships should be reduced to eighteen knots, we could cut our defensive cruiser to twenty-two knots and make corresponding increases in armament, protection, and ammunition supply. The importance of increasing these qualities cannot be overestimated, since the utility of this type is in direct proportion to the extent to which its design embodies them, after first providing for a certain minimum speed. Approximately the same remarks apply to these vessels as to battleships, regarding horizontal and underwater protection, utilization of main battery against aircraft, and protection of exposed personnel. While the turrets for the defensive battery might be somewhat thinner, they should be given all the protection that other considerations will permit.

The stock objection to building slow cruisers is that they can neither fight in the line nor scout with the fast cruisers. It should be emphasized that we are not advocating that they do either. The soundness of any proposed type is determined by its fitness to perform the functions for which it was designed; not by its unfitness to perform functions for which it was not designed, or to meet hazards to which it need not be exposed. We do not condemn a battleship because it can neither fly nor operate submerged.

Incidentally, does not this proposed defensive cruiser offer a way out of the existing international disagreement on cruisers? Other powers insist that their defensive needs call for numerous *small* cruisers. What objection can there be to our building the same total tonnage of *large* defensive cruisers, when their lack of speed would prevent their being used offensively? The same cannot be said of the small, fast, "defensive" cruisers. On the contrary, they are particularly suited to raiding and other offensive operations. If there is anything essentially righteous in building cruisers of an unmistakably defensive type, the moral factor would be all on our side.

Many naval officers have an unreasoning aversion to the word "defensive." They do not realize that the economic life of the nation depends upon an adequate defense for certain vital trade routes; that a fleet cannot operate from an insular base unless there exists an adequate defense for its line of communications with the mainland; that the safety of the fleet in thick weather depends upon the strength of the cruisers in the defensive screen; that the ability to defeat the enemy's first big aërial attack or to approach hostile shores will depend to a great extent on the presence in sufficient numbers of these stoutly protected and heavily gunned cruisers; and that, in battle,

the ability of aircraft carriers to continue operations will depend largely upon the effectiveness of the defense afforded them by these vessels. If these defensive functions could be seen as an absolutely vital means to the desired end, the prejudice against this adjective would disappear.

If we agree that these defensive duties are vital, two conclusions follow. One is that they cannot be intrusted to such miscellaneous bits of floating junk as are considered unfit for anything else. The other is that our problem consists in taking care of them with the minimum expenditure of men and tonnage, in order that we may have the maximum of men and tonnage available for offensive functions. So far as these duties are concerned, one 25-knot cruiser would probably be worth two of the present high-speed type; while if the speed of future battleships should permit a cut to twenty-two knots for these defensive cruisers, the resulting ship would represent nearly as much defensive strength as three fast cruisers. We should not delude ourselves with the idea that by building offensive cruisers for defensive duties we would be adding to the offensive strength of the fleet. On the contrary, we would be frittering it away. What would we think of a man who bought from four to six race horses to do heavy work that could be done more effectively by a pair of truck horses?

We have until now considered only those cruiser functions which call primarily for the maximum in striking and resisting power; there remain those in which the prime requisites are striking power and speed. So far as the latter are concerned, does not the 10,000-ton airplane carrier—or rather its planes—offer not only more striking power, but incomparably more speed? The fast cruiser will not, of course, ever be entirely superseded by the carrier, because planes are not all-weather craft. In flying weather, the carrier offers the following advantages: its planes can attack long before the guns of the cruiser could open fire and can continue to do so as long as machines and pilots hold out and flying decks are uninjured; these attacks can be launched while the carrier is in a sheltered position protected by the guns of more robust vessels, while the cruiser must get out where it is exposed to the gunfire of similar ships before it can use its own guns; the planes can be used to harry a retreating fleet regardless of its speed or the type of vessel singled out for attack; they are also able to bomb objectives ashore which could not be reached by the guns of a ship; and finally, the great speed of the planes enables them to effect concentrations which could not even be approached by the relatively slower "fast" cruisers.

The usefulness of the latter type, moreover, has been curtailed. It cannot be used in the advance screen nor for any independent duty in waters where large hostile air forces may be encountered. We already have, built and building, eighteen cruisers of this type, but we have no defensive cruisers and no 10,000-ton carriers; in fact, we have not even our treaty allowance of larger carriers. In view of these conditions, it is obvious that our building for several years should be devoted to carriers and defensive cruisers and that it is futile to discuss the characteristics of high-speed cruisers.

There is one point that should be mentioned before dropping this subject. Our naval authorities have reasons of unquestionable soundness for insisting on the 8-inch gun. So long as we adhere to this caliber, and in view of the increased effectiveness of other weapons designed to sink these ships, it is manifest that any fast cruiser of much less than 10,000 tons would be so lacking in protection that its chances of surviving a closely fought naval battle would be negligible. Although they might be of some value in control operations, it is by their value in a decisive engagement that they stand or fall. Judged by this standard, they are not worth building.

On the contrary, the question may well be raised if it would not be advantageous to us to press for an increase in the maximum displacement of cruisers to 12,000 tons, without setting a correspondingly higher maximum for the total cruiser tonnage allowed any power. Certainly, on 12,000 tons, we could build much better balanced high-speed cruisers and far more effective aircraft carriers. The larger cruisers would also require proportionally fewer men to man them—a point of particular interest to a power compelled to pay more for personnel than its rivals.

DESTROYERS

Although our strategic requirements have always called for the ocean-going destroyer, it has not been adopted because of the belief that the rôle of the destroyer called primarily for numbers. The idea was not only to provide a multiplicity of targets, but to keep the size of individual targets as small as possible. The likelihood of increased use of smoke in destroyer attacks and the probable counter of barrage fire by the battleships have previously been pointed out. Under these conditions, a smaller number of larger destroyers would stand a better chance of getting through the barrage and run less risk of collisions with each other. They would not only be more able to cope with counterattacking forces, but could attack in weather in which the small destroyers could not make the required speed. This last point is of special importance to a power which aims at control of the sea and must be prepared to fight in any weather.

The experience of the war is all in favor of increased size. The existing destroyers were lacking in fuel capacity, habitability, and seaworthiness. Of far greater importance is the fact that the destroyer actions of the war were consistently won by the larger boats, even against superior numbers. During the first three years, the British had the advantage in size and were steadily victorious. Then the Germans, with their usual acumen, saw the point and began turning out big destroyers with which they were even more strikingly successful.

There are, moreover, certain cruiser functions which call for numbers, rather than the maximum size and striking power. However, we have previously pointed out the undesirability of building vessels of a purely cruiser type of less than 10,000 tons. The only apparent answer to this problem is to build destroyers large enough to have the sea-keeping capacity of small cruisers and use them, when necessary, for these minor cruiser duties.

The large destroyer is of particular importance to the United States. If our lack of bases calls for large cruisers, it calls even more emphatically for large destroyers. Various independent functions of this type are of unusual value to us. They also require proportionately fewer men to man them.

The airplane has taken over most of the short-range and fair-weather functions of the destroyer. This means that the stress is now on the long-distance and bad-weather functions, which call for increased displacement.

The advent of airplanes has, moreover, added greatly to the hazards to which these vessels are liable. Since it is impossible to provide them with adequate protection, and since they must occupy a somewhat exposed position, it is clear that they should have an unusually strong antiaircraft battery for their size. It is proposed that they be armed with two nonuple 37-mm turrets and that their main battery be given eighty degrees elevation and supplied with plenty of shrapnel.

Should not these vessels be given *some* protection? Certainly turrets or gun houses, as well as ship- and fire-control stations, must be bullet- and shrapnel-proof. Aërial bombs of varying sizes, exploding under water at various distances from the hull, mean that we must concern ourselves with explosions ranging from those barely strong enough to rupture the thinnest plating to those of annihilating force. Although we cannot hope to protect these vessels against all explosions, the more of them that they can withstand, the better their chances of staying afloat and in the fight. Consequently, even minor improvements in underwater protection are of value. Similarly, would not a vaulted deck of even one-inch armor, over the machinery spaces and magazines, afford enough protection from shell splinters and fragmentation bombs to be worth while?

Since this is primarily an offensive type, it is manifest that the increase in size must justify itself in increased striking power. The torpedo capacity and the strength of the main battery must be augmented proportionally. Yet we must keep their displacement within bounds in order that we may have the requisite numbers.

Can we not meet these conflicting requirements by reducing their speed to thirty-two knots? The increased use of smoke screens means that extreme speed will be less essential for destroyer attacks. When these vessels are employed on independent duties, the principal menace will be from the air. Speed would then be of negligible value; their safety would depend upon antiaircraft fire and what little protection we have been

able to give them. Furthermore, when in the screen or making torpedo attacks in average to bad weather, it is doubtful if they could utilize higher speed if they had it.

Our proposed ocean-going destroyer would be of approximately 3,000 tons, thirty-two knots, four 6-inch guns, eighteen 37-mm guns, thirty or more torpedoes, plenty of antiaircraft ammunition, large fuel capacity, and all the protection that can be worked in with the foregoing requirements.

The only objection to such a destroyer is that it is larger and faster than is needed for antisubmarine operations. However, in the late war, we discovered that our depth-charge barrages were little, if any, more effective than single depth charges as dropped earlier in the war. Space does not permit giving the reasons for this; it is enough to say that an efficient barrage requires such elaborate equipment that it can be carried only by a special antisubmarine destroyer.

We have previously mentioned the need for a special destroyer type to assist the cruisers in the protective screen around the carriers. This calls for a strong defensive battery of two 5-inch guns and eighteen 37-mm guns, some small torpedoes, and much the same protective features as the ocean-going destroyer.

The speed requirements in either case would be modest. A sustained speed of twenty knots and bursts of about twenty-five knots would be enough. Twin, high-speed, light-weight Diesel engines are what we should aim at for their power plant; although we must probably content ourselves temporarily with a steam installation of correspondingly smaller cruising radius.

A special defensive destroyer is, therefore, proposed to supplement the ocean-going destroyer. They would be used for the protection of convoys; for an antisubmarine screen around the larger vessels of the fleet; for protecting carriers during a battle; for certain classes of patrol duty; for fleet sweepers; and for strengthening the defensive screen around the main body the night preceding or following a battle, when the other destroyers would be absent on offensive missions. It is not advocated that these vessels be built in quantity in peace time. One every few years would insure that we always have on hand a modern, thoroughly tested design, ready to put into quantity production in case of war.

Summary

The advent of aircraft has had the following effect: battle cruisers and light cruisers have been superseded to a great extent by airplanes for scouting and as a high-speed striking force; the defensive duties of cruisers and destroyers have been increased; speed is of less value than formerly to surface vessels; raiding has become more hazardous; control of the sea will be more nearly absolute, and consequently, of greater value; fleets must remain concentrated when in the vicinity of hostile air forces; drastic measures must be taken for the protection of aircraft carriers; the value of submarines and of large, fast merchant vessels capable of conversion into carriers is notably enhanced; and finally, the airplane has so added to the number and effectiveness of weapons designed to sink ships that the offensive will be impracticable unless we can markedly increase the defensive strength of individual ships and of the fleet as a whole.

It is proposed to meet this situation by reducing slightly the speed of all types of ships; by increasing their protection, defensive batteries and, whenever possible, their displacement; by the addition of two purely defensive types, a cruiser and a destroyer; and by changes in the tactical disposition and employment of ships.

Whether or not the reader approves of the solution herein advocated, he cannot deny that there has been a revolution in the weapons and consequently, in the conditions of naval warfare. The power which most accurately estimates the new situation and most quickly adapts itself thereto, will gain a tremendous advantage. One outstanding trait of our people has always been their swift adaptability. Here is an almost incredible opportunity for the exercise of our national genius. What are we going to do about it?

Short Cuts *for* Moon Sights

By Lieutenant Commander P. V. H. Weems, *U. S. Navy*

HERETOFORE, the moon has been used comparatively little for working Sumner lines of position. At the same time there is a real and increasing need for its practical use. With the increased speed of surface vessels, and with the extended flights being consummated and projected, the means for getting an absolute fix during the day are important. One observation of the sun merely gives us a line of position, and not an absolute fix. Therefore, the sun alone is not satisfactory for air navigation, even assuming that the difficulties of observation can be overcome. As Major Lanphier, U. S. Army, who is taking up the study of the subject, states it: "What can we do with the single lines of position in the air when we travel at more than a hundred miles an hour, and have to wait two or three hours before the sun changes bearing enough to get any sort of fix?" Lanphier here puts his finger on the weakest point of celestial navigation, especially as applied to air navigation.

If we can devise a method for working a moon sight with the same facility as we can work a sun sight, navigation and aërial navigation will be greatly simplified, especially in high latitudes. For example, in transpolar flights in the summer, the moon could be used with the sun about seventy-five per cent of the time. In lower latitudes, the moon would be available from about twenty per cent to about forty per cent of the time. If a moon sight can be made as easy as a sun sight, we could obtain a definite fix about thirty per cent to forty per cent of the daylight hours.

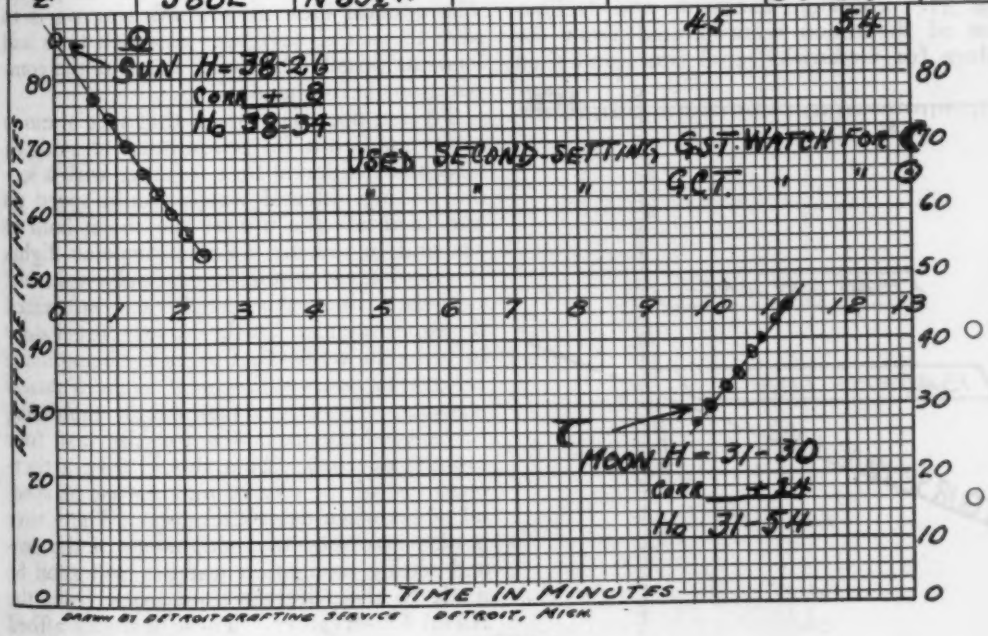
Now let's see what we can expect of a moon sight as regards speed of solution. If the Greenwich civil time is converted to Greenwich sidereal time in the usual way, we have at once enough work to make navigation slow. The first problem, then, is to get around the necessity for converting civil to sidereal time. ***This not only can but should be done.*** The price we pay for this is the cost of special equipment in the form of a second-setting watch and special moon tables about twelve times as long as the present moon tables.

The *Nautical Almanac* gives the right ascension, declination, semi-diameter and horizontal parallax of the moon for every two hours of Greenwich civil time. The only need for Greenwich civil time is to pick the moon's elements from the *Nautical Almanac.* The Greenwich sidereal time is needed to combine with the right ascension to get the hour angle, and the hour angle is necessary for the solution of the spherical triangle. If now, we compute the moon's elements for intervals of Greenwich sidereal time, we at once avoid all necessity for Greenwich civil time. Since it is a simple matter to rate a watch to sidereal time, and since the second-setting feature provides this time to the exact second, the watch reading may be used to pick out the right ascension and declination.

The next difficulty is to overcome the tedious interpolations heretofore necessary to get these elements accurately for the instant of observation. We can avoid a great part of the present work by expanding the moon tables to give the right ascension and declination for ten-minute intervals. The *Nautical Almanac* gives the moon's elements for two-hour intervals; therefore, the tables would have to be expanded about twelve times to give ten-minute intervals. This does not mean twelve times the present forty-seven pages of tables. In the expanded tables the difference for two hours together with the semi-diameter and horizontal parallax columns could be omitted, and the two latter given at the bottom of the page for each day. A convenient arrangement would seem to be to have a page for each day, or a total of 365 pages. This would make a book about twice the size of the present *Nautical Almanac.* If preferred, these

PASSAGE SAN PEDRO to HONOLULU G.C.T. DATE 28 MAY 1928

	1540/MOON	1540 2 SUN	3	4	5	6
GCT(or GST)	17-20-00	1-00-00				○
EQT(or RA)	11-52-12	+ 2-57.3		DATA OBSERVED		
GAT		1-02-57.3		MOON	SUN	
GHA(TIME)	5-27-48	13-02-57.3		(G.S.T)	(G.C.T.)	
GHA(ARC)	81°-57'	195°-44'4		17-19-43	1-00-33	
LONG.(ASSUMED)	138-57	138-44.4		19-56	00-51	○
LHA	57°E	57°W		20-12	1-09	
LAT(ASSUMED)	28°N	28°N		20-22	1-24	
				20-32	1-34	
K ±	44-18.7N	44-18.7N		20-42	1-48	
DEC	6-26.0N	21-23.7N		20-58	2-03	
K~DEC.	37-52.7	22-55		21-07	2-18	
				H_3 ☾	H_3 ☉	
A	17259	17259		31-28	38-17	
B + −	10275	3571		30	14	
LOG Hc	27534	20830		33	10	
Hc	32-02.3	38-14½		35	6	
Ho	31-54.0	38-34		38	3	○
a	8.3A	19½T		40	0	
Z	S80E	N83½W		43	37-57	
				45	54	


SUN H-38-26
Corr. + 8
Ho 38-34
USED SECOND SETTING G.S.T. WATCH FOR ☉
" " " G.C.T. " " ☾
MOON H-31-30
Corr. +24
Ho 31-54
TIME IN MINUTES
0 1 2 3 4 5 6 7 8 9 10 11 12 13
0 10 20 30 40 50 60 70 80

DRAWN BY DETROIT DRAFTING SERVICE DETROIT, MICH.

FIGURE I

pages could be in loose-leaf form, or the tables could be bound separately for each quarter, in pamphlets about half the size of the *Nautical Almanac*.

Even with moon tables for ten-minute intervals, errors of from three to five miles may result if the nearest ten-minute interval is used without interpolation. Even in the air this is too large an avoidable error to allow. We can make use of cross-section paper to avoid both the necessity of averaging the altitudes and times of observations, and for making any interpolations whatever. Figure 1 will illustrate a moon sight worked without computations of time, and without any interpolations. Figure 2 shows the moon line crossed with a sun line, the work for the moon line requiring practically the same work as that for the sun.

The actual computations for moon tables for ten-minute intervals over a period of several days were made with the interested coöperation of Ensigns R. E. Johnson, P. K. Wells, and W. R. D. Nickelson. The conversion of the tables from civil to sidereal time was done by constructing a civil-time scale in proportion to a sidereal-time scale as laid down on cross-section paper (see Fig. 3). The right ascension and declination of the moon were plotted from the values for Greenwich civil time, and then tabulated for ten-minute intervals of Greenwich sidereal time. Two of us completed tables for a day in one hour, and with sufficient accuracy for practical purposes. The Greenwich sidereal time for the Greenwich civil date was used.

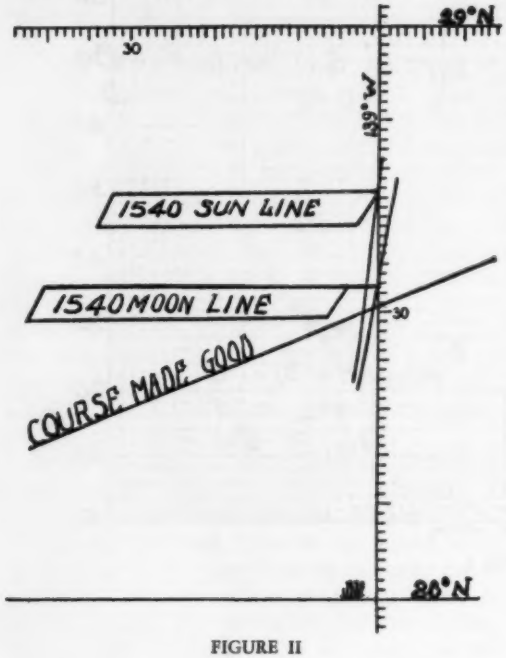


FIGURE II

What is apparently another clear-cut shortening of the present moon tables is the idea suggested by Lieutenant M. F. Schoeffel, U. S. Navy. In the present moon tables, the right ascension is given for a definite instant of time for each day of the year, and this right ascension applied to the Greenwich sidereal time gives the Greenwich hour angle. Why not apply the right ascension to the Greenwich sidereal time and write down the Greenwich hour angle and thus save one more step in the present long method used to compute the moon's hour angle? By using a Greenwich sidereal-time second-setting watch, special Greenwich sidereal-time moon tables with the Greenwich hour angle and declination tabulated for every ten minutes, a moon sight should be practically as easy and just as accurate as a sun sight. If anyone knows of a drawback to using the Greenwich hour angle, it will be appreciated if it is made public. The general idea we are working on is to save the aërial navigator as much time and labor as possible by doing most of the computations beforehand.

To sum up, it is obvious that special moon tables made out for ten-minute intervals of Greenwich sidereal time together with a second-setting sidereal watch would speed up and facilitate the use of the moon both at sea and in the air. For transpolar flights this equipment would be especially valuable.

NOTE: Since this article was submitted the superintendent of the Naval Observatory informs the writer that plans are being made for getting out a supplement to the *Nautical Almanac* (separate pamphlet) tabulating the special moon tables for the last four months of 1929. This should give a thorough test of the idea of making use of special tables when using the moon. The writer is also informed that shipments of the second-setting navigation watches will soon be made to the Aircraft Squadrons from the Naval Observatory. These watches afford a clear-cut saving in computing the hour angle.

If the Greenwich hour angle (G.H.A.) is tabulated for ten-minute intervals of

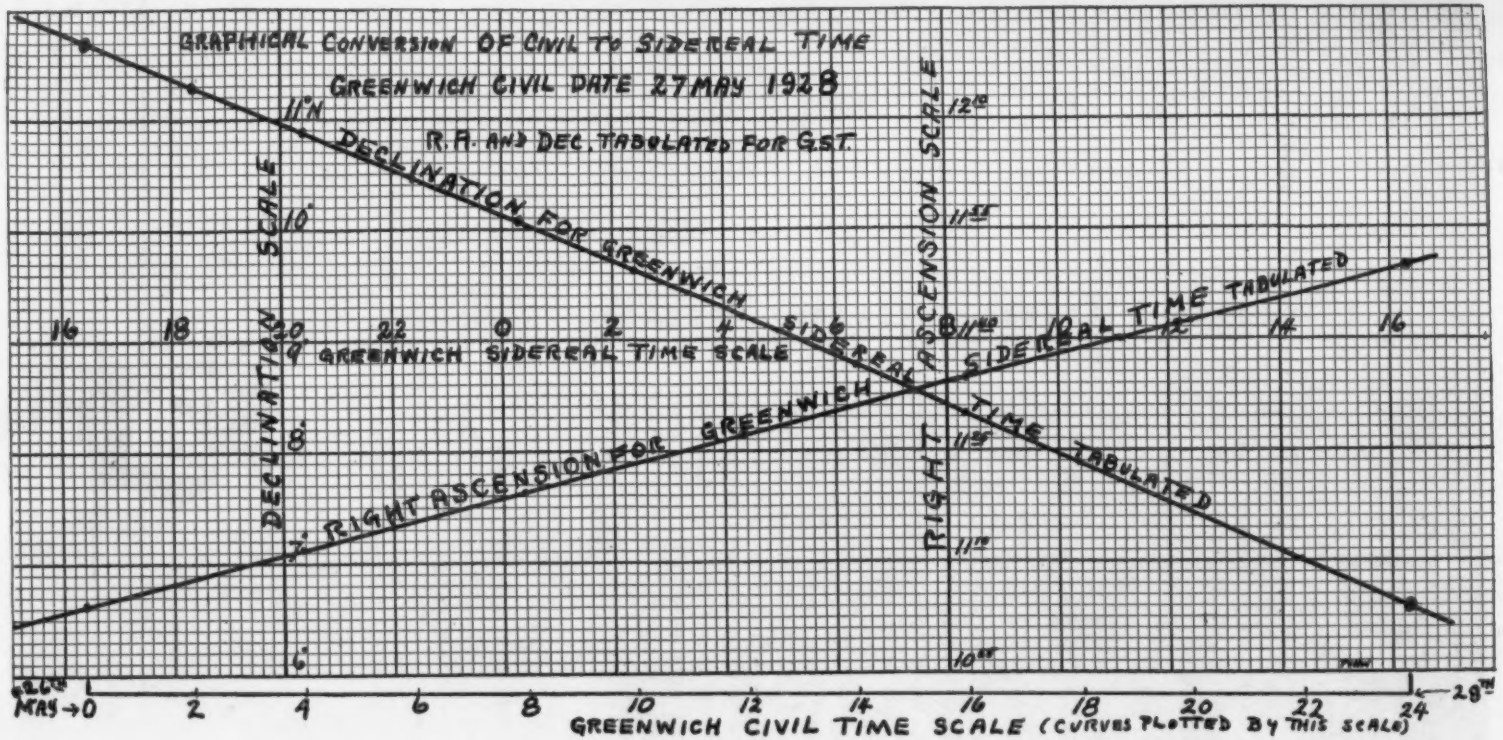

GRAPHICAL CONVERSION OF CIVIL TO SIDEREAL TIME
GREENWICH CIVIL DATE 27 MAY 1928
R.A. AND DEC. TABULATED FOR G.S.T.
DECLINATION FOR GREENWICH SIDEREAL TIME TABULATED
RIGHT ASCENSION FOR GREENWICH SIDEREAL TIME TABULATED
DECLINATION SCALE
RIGHT ASCENSION SCALE
GREENWICH SIDEREAL TIME SCALE
GREENWICH CIVIL TIME SCALE (CURVES PLOTTED BY THIS SCALE)
MAY → 0
11°N
10'
9'
8'
6'
12h
11h 52m
11h 48m
11h 44m
11h 40m
10h 56m
16 18 20 22 0 2 4 6 8 10 12 14 16
2 4 6 8 10 12 14 16 18 20 22 24
28m

FIGURE III

time we may use intervals of G.C.T., but due to the fact that the hour angle changes as fast as the time (on the average), there is an interpolation for approximately ten minutes, or 150′. By making this interpolation we save two steps necessary to convert G.S.T. to G.H.A. in arc. In practice, the moon observations would ordinarily be taken on the even ten minutes of G.C.T., in which case all interpolation is avoided. The tables showing the G.H.A. may be put down as follows:

G.C.T. H.M.	*G.H.A.*	*M.D.*	*DEC*
0-00 (W)	74°-13′.5	+14′.5	+11°-45′.5
10	76°-43′.0	14′.5	43′.00
20	78°-12′.5	14′.5	41′.0

et cetera.

Thus we have a choice of using G.S.T. and R.A. with very little interpolation, or G.C.T. and G.H.A. with one interpolation of a large increment. By picking out G.H.A. direct we may use G.C.T. and save two steps (combining R.A. and G.S.T. and converting the G.H.A. from time to arc). Since there is an advantage in using the same watch for both the sun and moon, and since observations may usually be made on even ten-minute intervals in order to save all interpolations, it appears to be the best plan to tabulate the G.H.A. and declination in arc for intervals of ten minutes of G.C.T. as shown.

Table I

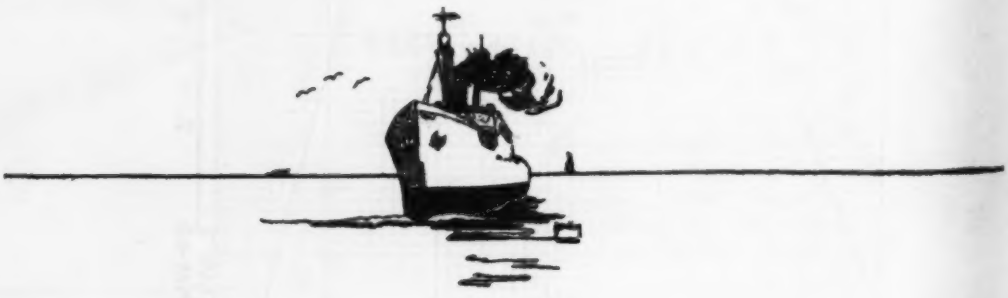
PORTION OF MOON G.S.T. TABLE

Moon's R.A. and Dec. for G.S.T. for G.C. Date, May 27, 1928

Abbreviations used:

M.D.—Minute Difference.
H.P.—Horizontal Parallax.
G.S.T.—Greenwich Sidereal Time.
R.A.—Right Ascension.
DEC.—Declination.

G.S.T.	R.A.	DEC.
16-00	11^h-03^m -44^s	11° 45′.5
10	4 -03	43′.0
20	4 -22	41′.0
30	4 -41	39′.0
40	5 -00	37′.0
50	5 -20	35′.0
M.D.	+ 2	-0.2
17-00	11-5 -40	+11° 33′.0
10	5 -59	31′.0
20	6 -18	29′.0
30	6 -37	27′.0
40	6 -56	25′.0
50	7 -16	23′.0
M.D.	+ 2	-0.2
18-00	11-7 -35	+11° 20′.5
10	7 -35	18′.5
20	8 -15	16′.5
30	8 -35	14′.0
40	8 -54	12′.0
50	9 -14	10′.0
M.D.	+ 2	-0.2
19-00	11-9 -33	+11° 08′.0
10	9 -52	06′.0
20	10 -11	04′.0
30	10 -30	02′.0
40	10 -50	+11° 00′.0
50	11 -14	+10° 58′.0
M.D.	+ 2	-0.2
20-00	11-11 -30	+10° 56′.0
10	11 -50	53′.5
20	12 -12	51′.0
30	12 -30	49′.0
40	12 -50	47′.0
50	13 -12	45′.0
M. D.	+ 2	-0.2



P & A Photos Official Photograph Aircraft Squadrons, Battle Fleet

OUT OF THE SMOKE

U. S. S. *Lexington* steaming through a smoke screen

Courtesy Ford Motor Company

AN AIRPORT CAN BE BEAUTIFUL
Ford Airport in Dearborn. Note the concrete runways.

Courtesy Ford Motor Company

EXTERIOR VIEW OF HANGAR BUILDING, FORD AIRPORT, TAKEN AT NIGHT

Courtesy Ford Motor Company

VIEW OF THE STOUT METAL AIRPLANE COMPANY, DIVISION OF FORD MOTOR COMPANY
Showing a portion of the assembly line of Ford planes

Courtesy Ford Motor Company

WASP-POWERED FORD PLANE, MODEL *5-AT*
Destined for the Pan-American Airways' Central American service

Courtesy Ford Motor Company

THE INTERIOR OF ONE OF THE TRANSCONTINENTAL AIR TRANSPORTS
Wasp-powered Ford tri-motored monoplanes

Courtesy Chance Vought Corporation

VOUGHT "CORSAIR" AMPHIBIAN AS USED ON THE CARRIERS *SARATOGA* AND *LEXINGTON*

Courtesy Chance Vought Corporation

VOUGHT NAVY "CORSAIR" EQUIPPED WITH HANDLEY-PAGE SLOTTED WINGS

Courtesy Curtiss Aëroplane & Motor Company, Inc.

CURTISS ROBIN THREE-PLACE CABIN MONOPLANE
With Curtiss "Challenger" 170-horsepower radial engine

Courtesy Curtiss Aëroplane & Motor Company, Inc.

CURTISS "FALCON" MAIL PLANE WITH LIBERTY ENGINE

CURTISS "FALCON" MAIL PLANE WITH LIBERTY ENGINE

Courtesy Curtiss Aëroplane & Motor Company, Inc.

CURTISS "FALCON" DESPATCH PLANE WITH CURTISS "CONQUEROR" 625-HORSEPOWER PRESTONE COOLED ENGINE

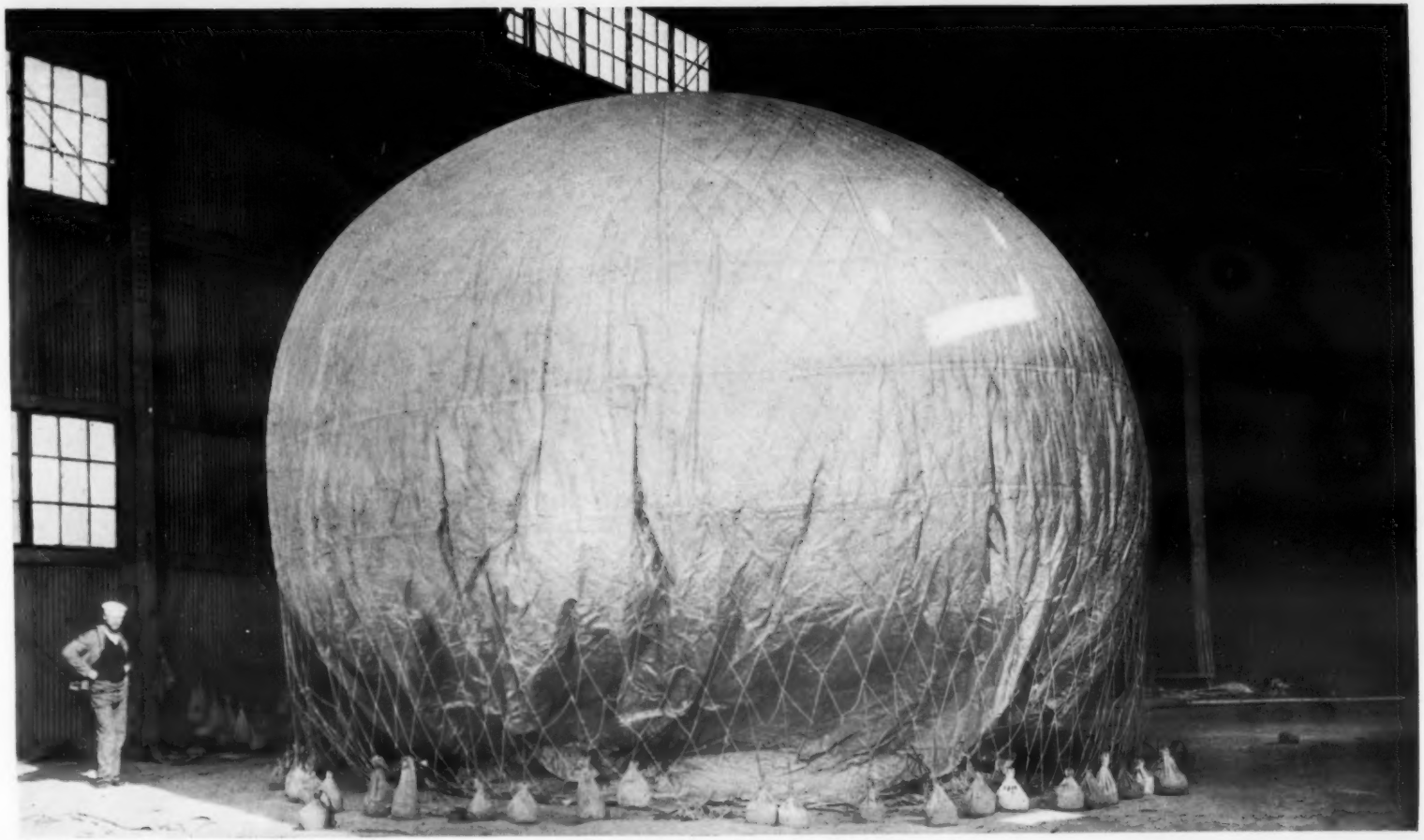
Courtesy Curtiss Aëroplane & Motor Company, Inc.

CURTISS "HAWK" SEAPLANE WITH CURTISS D-12 ENGINE

Courtesy Bureau of Aëronautics, Navy Department

BALLOON READY FOR FLIGHT

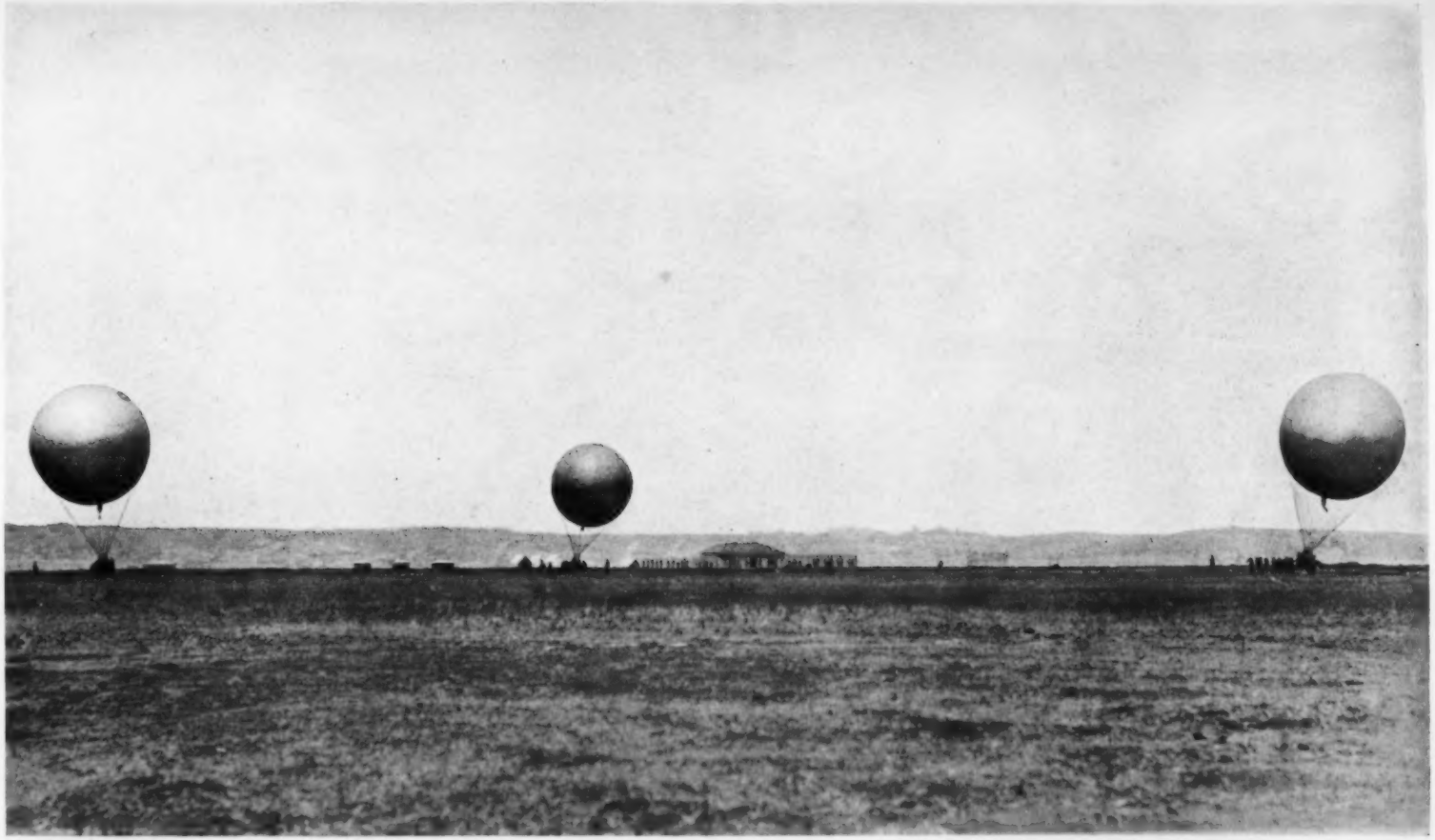
This is a 19,000-cubic-foot balloon, just before taking off for a flight from Lakehurst to Lisbon Falls, Maine, which constituted an unofficial distance record for this size balloon; time of flight twenty hours. Lieutenant Settle, pilot, left, Lieutenant Mayer, right.



Courtesy Bureau of Aëronautics, Navy Department

INFLATING 19,000-CUBIC-FOOT FREE BALLOON, LAKEHURST
The balloon which made the flight to Lisbon Falls, Maine

The balloon which made the flight to Lisbon Falls, Maine



Courtesy Bureau of Aëronautics, Navy Department

THREE BALLOONS READY TO GET AWAY IN AN UNOFFICIAL RACE, SAN DIEGO, CALIF.

Courtesy Bureau of Aëronautics, Navy Department

INSTRUMENTS AND GEAR USED IN NAVAL BALLOON RACE, AKRON, OHIO, MAY, 1927

Winning *a* Balloon Race

By LIEUTENANT T. G. W. SETTLE, *U. S. Navy, Pilot Navy Balloon No. 1*
National Balloon Race, 1929

INTRODUCTION

THE question is often asked, "What good are balloons anyway?" The answer is that they are an indispensable link in the long chain of training of airship personnel, both officers and men. Every airship, fundamentally, is a free balloon plus engines. In an airship underway, both the static and dynamic conditions of the ship must constantly be accurately known and controlled; practical aërostatics is taught in the school of the free balloon. There is an analogy in the training in small boats of those who "go down to the sea" in surface ships.

There are important secondary functions of the balloon, namely the collection of meteorological data, and the study of the "behavior of the air," particularly with reference to airship operations.

As a sport, free ballooning is unexcelled by any other known to man; ask any balloonist for confirmation of this. The Navy has always "gone in" for sports of all kinds and usually excels in them. Following is the story of the Navy's recent participation in the King of Sports, that is, the winning of the National Balloon Race, May 4, 5, and 6, 1929, by Navy Balloon No. 1.

PREPARATION

Shortly before 5:00 P.M., Eastern Standard Time, on Saturday, May 4, a scene was being enacted in the University of Pittsburgh Stadium, the like of which is seldom witnessed in such a shrine of football and track athletics. Twelve 35,000-cubic-foot free balloons were bobbing around in a somewhat gusty breeze, on the "deck" of the stadium. They were the seven civilian, three Army, and two Navy entries in the 1929 National Elimination Balloon Race, and they were "raring to go."

All day the field had been swarming with pilots, aides, and many assistants, busily engaged with the multitudinous details of inflating and preparing the balloons for the race. Lieutenant Charles E. Bauch, U. S. Navy, the very efficient operations officer, was probably the busiest one man. He had to keep in touch with all details, from assuring himself that all balloons had adequate numbers of hydrogen gas bottles, to answering foolish questions of reporters and spectators.

From these twelve entries would be chosen the two balloons which, with the winner of last year's International Race, are to form the American team for this year's Gordon Bennett Trophy International Race. Captain W. E. Kepner, of the Army Air Corps, by winning last year's event, secured the race this year for this country. It will be held in St. Louis in September.

For the benefit of those who may not be balloon-race fans, all balloon races are for distance only. Distances are computed between the points of take-off and landing, by great circle, regardless of time consumed and actual route taken.

My aide in Navy Balloon No. 1 was Ensign Wilfred Bushnell, U. S. Navy. We had a ground crew of three experienced men from Lakehurst to assist us in inflation and rigging the balloon. In charge of our ground crew was Chief Boatswain's Mate George N. Steelman, U. S. Navy, an old-time balloonist and my aide in previous races. With Steelman in charge of the rigging of our balloon, Bushnell and I had nothing to worry about except the weather, which looked none too promising as the afternoon wore on. Assisting us during the inflation was Lieutenant Fulton and about fifteen naval reservists of the Pittsburgh Unit; thus, so far as we were concerned, it was an all-Navy affair. Navy Balloon No. 2, piloted by Lieutenant Jack C. Richardson, U. S. Navy, with Lieutenant (J.G.) M. M.

Bradley, U. S. Navy, as aide, had a similar Lakehurst ground crew with reserve assistance.

The captain of our Navy Balloon Team was Lieutenant F. W. Reichelderfer, U. S. Navy, experienced balloonist, veteran of many races, and an officer whose research and development work in meteorology and aërology, particularly in connection with naval aviation, has been of outstanding value in the progress of aëronautics. He, of course, functioned as team aërological officer in addition to being team captain. Mr. Andrus, of the Department of Commerce Meteorological Section, was on hand; Andrus' accomplishments and attainments are too well known to need any further mention here. We felt that with Andrus and Reichelderfer on the job, we had the very best talent in that line available in the world. Their advice, the upper air soundings, and other data furnished prior to take-off, were most valuable.

During the afternoon we "cruised around" the field and met many old friends and competitors of other races. Captain Honeywell, the veteran balloonist from St. Louis, was one of the entries, of course. Van Orman, of Goodyear, national and international champion for many years; Hill, of Detroit, also national and international champion in past years; Hill, Flood, and Ent, of the Army—these and others were all on hand.

The start had been postponed for an hour because of the too gusty wind in the stadium; it had been raining off and on, dampening our balloons and ourselves, but not the ardor of the spectators, especially our "sweethearts and wives." The sky looked generally threatening, with low clouds from the southwest.

At last five o'clock came and the first balloon, with Klikoff and Larsen, of Detroit, was in the air. The balloons were to take off at three- to five-minute intervals and Navy No. 1 was to be the twelfth, or last to get away. Our turn rolled around at 5:45. The wind and gustiness in the stadium had lessened markedly but it was still raining lightly. Everything was in readiness in the balloon; Steelman walked us over to the point of take-off at the lee end of the field; Bauch "weighed us off" to assure himself that we had the proper positive buoyance for the take-off; we hurriedly embarked our bouquet of roses from our sponsor; sponsor and wife were well kissed, much to the delight of our ground crew of bluejackets; Bauch gave the command "hands off"; we started to rise slowly and surely out of the stadium, and the race was on.

Until Midnight

After taking off, it was our decision to maintain low altitudes; this was indicated from both general and local weather considerations. We passed over the city and suburbs of Pittsburgh in a general northeasterly direction, at between 300 and 800 feet altitude above the ground, making about ten knots speed, in the gathering darkness made still darker by the heavy and low-lying clouds. We very soon lost sight of all the other balloons except Navy No. 2, which kept a couple of miles southeast of us and at about our altitude until we lost him in the darkness. After clearing the city, we followed up the right bank of the Allegheny River. At 6:15, passed over Verona, Pennsylvania; at 6:30, over New Kensington, Pennsylvania; at 8:10, about three miles to the southeastward of Kittanning, Pennsylvania; it was now raining hard and was practically dark. We put over our "running light," which consisted of an "all-around" white light, battery supplied, hanging about fifteen feet below the basket, and supposed to have great potentialities in preventing other craft from getting too familiar with us during the night.

We had taken off with about 1,170 pounds of sand ballast in 30-pound bags, and over 200 pounds of instruments and equipment on board. This equipment included parachutes, bottled minnows for bait (in case of a forced landing in the wilderness), automatic gun, fish hooks, Very pistol, blankets, flashlights, H. F. radio receiver, charts, matches in a waterproof container, first-aid kit, sandwiches, cake, fruit, coffee, soup, drinking water, and various other gear. Over the basket we had a rubberized fabric rain canopy to keep the ballast and ourselves dry in case of a hard driving rain. We stuck our bouquet of roses up under the rain canopy, assuming that they would keep fresh for a long time in the damp cool air; and their scent overcame the smell of rubberized fabric which usually pervades a balloon basket. Our instruments consisted of an altimeter, statoscope, variometer (showing our rate of rise or fall in meters per second),

a max-min thermometer; two compasses, one an airplane type, the other a pocket compass; the "ship's clock," which was in reality an Ingersoll luminous dial dollar chronometer, supplemented by an unreliable wrist watch of Bushnell's; and, most important of all, our barograph, a recording altimeter, which was sealed by a representative of the National Aëronautical Association prior to take-off, and which constitutes the official instrumental record of the flight.

To get back to our story, Saturday evening after dark found us cruising along over the Pennsylvania mountains, in the rain-soaked but relatively smooth air, with heavy distant lightning visible to the eastward and southeastward, wondering how long and how far we would go this year. On the ground beneath us, and for miles around, there were groups of reddish-colored lights emitting fumes of some kind; we could not make out what these were but afterwards found out that they were coke ovens. We settled down for the night's work, straightened things up around the basket as much as we could, trying to make room for ourselves among the chaos of ballast bags, thermos bottles, sandwiches, etc. Through some streak of good luck, and good gas, we had gotten away with more ballast than anticipated, which, however, did not help the crowded condition of the basket. A peculiarity of balloon baskets is that they are always crowded.

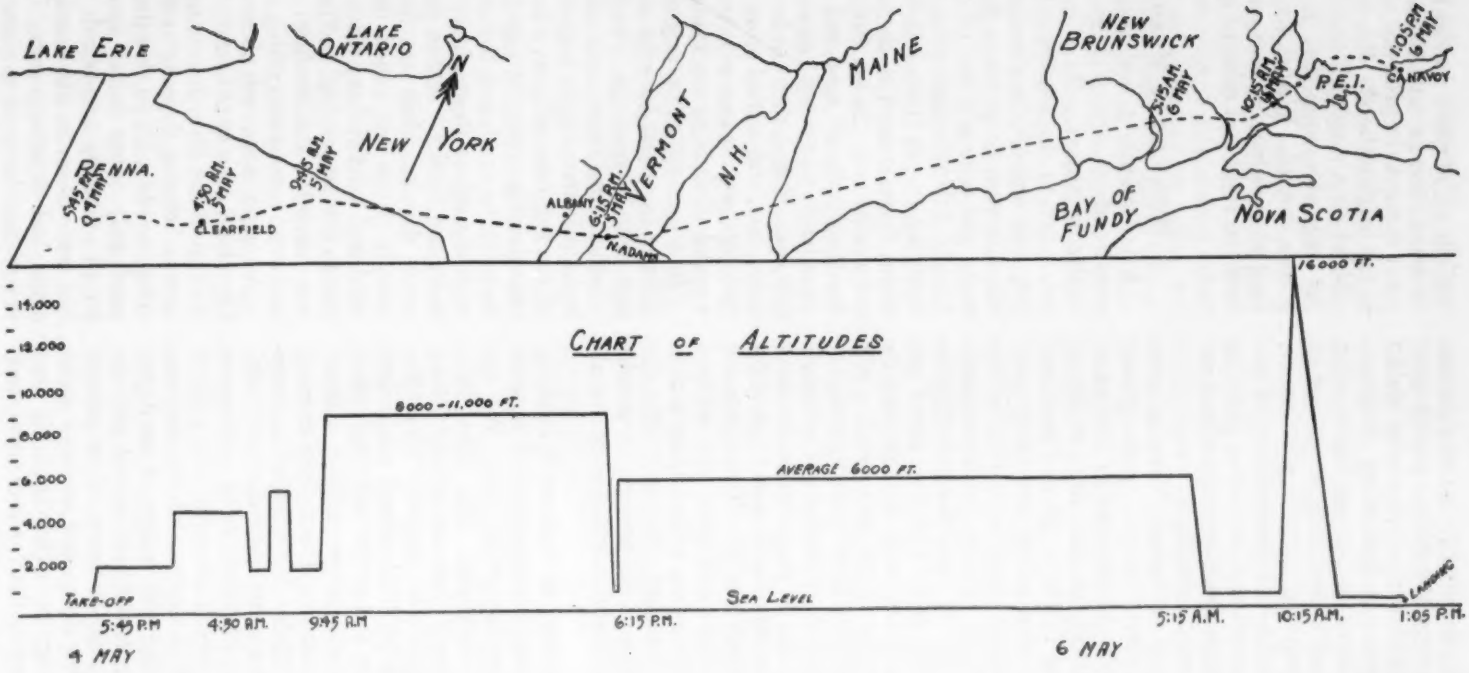
About 10:20 P.M. we noticed a blinking light up to the northwestward and at some hundreds of feet lower altitude. We answered with a flashlight. The other light said, "What ship?"; we answered, "Navy No. 1, what ship?"; he replied, "Navy No. 2." We talked by blinker and exchanged information for about ten minutes, when communication was broken off by a cloud coming in between us. During the evening we copied the regular Navy high-frequency radio weather map and upper-air data (telegraphically) broadcasted from Arlington (NAA). The signal strength was 7 to 8, very distinct. This weather information was helpful to us in the later stages of the flight. Towards midnight, the rain ceased and the sky partially cleared at times. Our ground speed was slowing down and we were making only seven knots. The lightning was still flashing away in the far southwest, but, to our relief, we apparently were not "closing" it. The static on the radio set was increasing; this gave us some uneasiness since static denotes the presence of thunder storms in the neighborhood. From time to time we nibbled on a sandwich and had some of the hot vegetable soup that Reichelderfer had gotten for us. We let the coffee alone as long as possible, because on a long trip you hate the sight and odor of coffee before the end.

Midnight to Midday, May 5

After midnight our speed lessened still more and at one o'clock we were practically becalmed. At 1:30 we started to get a set to the southward. Now, southerly was one of the directions in which we did not want to go since it would mean an early and untimely end of our flight on the Middle Atlantic coast after only a comparatively short run from Pittsburgh. Furthermore, there seemed to be fouler weather to the southward. So we dumped overboard a small quantity of sand and an empty grape juice bottle and started up in search of fairer breezes. Found them at between 4,000 and 4,500 feet, and settled down at that altitude, making good an east-northeasterly course at a speed of eight to ten knots.

In a balloon, as on any other Navy ship, a strict log must be kept at all times. Instrumental readings, navigational data, weather conditions, and all happenings of technical interest, are logged. This keeping of the log, especially on a long trip, involves considerable effort; at night, all instruments have to be read and the log entries made with the aid of flashlights. Usually the log is in the "other" basket pocket when one looks for it; while searching for it, one usually drops his pencil down among the sand and sandwiches; when one has finally gotten his temper, log, and pencil in hand, he has forgotten the readings which he took, and must reread everything.

At 4:50 A.M., we crossed the Hadley-Cleveland Airway at Clearfield and could see several of the long fingers of light from the airway beacons flopping around on the lowering clouds. Up to this time we had averaged only seven knots speed from Pittsburgh. Shortly afterwards the cloud layer had come down to and enveloped us, and we again had desultory rain. Then we heard the distant hum of a plane and wondered just where on a balloon it would be best to


LAKE ERIE
LAKE ONTARIO
NEW YORK
PENNA.
CLEARFIELD
ALBANY
VERMONT
N.H.
MAINE
NEW BRUNSWICK
P.E.I.
BAY OF FUNDY
NOVA SCOTIA
CHART OF ALTITUDES
16000 FT.
14,000
12,000
10,000
8,000
6,000
4,000
2,000
8000 - 11,000 FT.
AVERAGE 6000 FT.
SEA LEVEL
TAKE-OFF
LANDING
5:45 P.M
4:30 A.M.
9:45 A.M
6:15 P.M.
5:15 A.M.
10:15 A.M.
1:05 P.M.
4 MAY
6 MAY

have a plane ram you. However, this plane kept his distance and soon faded out of hearing.

The static had increased to a roar about four o'clock, but then commenced subsiding, much to our relief. The air continued to be smooth where we were, with an occasional "topographical" bump as we crossed an extra high ridge. "Bush" and I got no sleep this first night, as there was usually enough going on to keep us both busy. We were warm (lowest temperature was 53° F.) and fairly comfortable.

In a balloon you are always heavily drowsy towards daylight, even though you may have stored up much extra sleep in previous nights and be "doped up" on coffee. When the sun is up, you "snap out of it." We pulled ourselves together with the aid of the last of our soup, some coffee and the everlasting dry, and by this time unpalatable, sandwiches, and loafed in a cloud until about 7:00 A.M. Then a second's pull on the valve cord started us down to find out where we were. We came through the base of the cloud layer at 3,100 feet and saw below us heavily wooded mountains, all green and wet, a small and noisy stream chasing itself down each valley, and not a sign of habitation, road, or recognizable landmark in sight. We skimmed close over the ridges dipping down into the valleys, looking for some clue as to our wherabouts, and for want of anything better to do, remarking to each other on the beauty of the landscape. We were going in a general easterly direction at moderate and varying speeds, being pelted with rain from time to time. The air was smooth enough, however, and was heavily laden with the smell of green stuff from the forest below. Tiring of this "ridge hopping," about 8:00 A.M. we jettisoned some banana skins and a little sand and jumped into the clouds again. At 5,000 feet we encountered light snow, although the air temperature was relatively high, 43° F. A little after nine we came down again to have a look around, and found ourselves still in the same sort of country. On our way down, just below the cloud base, Bushnell discovered a half dozen or so rabbits running along through the trees on a sloping hill. They looked very large to me; I mentioned that I thought they were deer, but Bushnell maintained that they were rabbits, and he ought to know, as he hails from that part of the country. So we logged them as rabbits, but when we got down close to them, "Bush's" rabbits turned out to be about four feet long and some of them had horns.

At 9:45 A.M. we were able to hail a man in one of the valleys who gave us our position in Tioga County, Pennsylvania. At eleven o'clock, the high clouds dissolved and the sun started breaking through the low clouds. We went up to about 7,000 feet and found there a bright and hot sun shining in a cloudless sky overhead; we could see the ground through holes in the low clouds. The sea of white clumps of strato-cumulus clouds, extending as far as the eye could see in all directions, was an impressive sight, impossible to describe but well worth a balloon trip to see. We had averaged eighteen knots from Clearfield.

Midday to Sunset, Sunday, May 5

Throughout the afternoon we cruised at between 8,000 and 11,500 feet altitude.* The air was smooth and the warm sun took all of the chill and dampness of the previous night out of our bones; in fact, it sunburned us very thoroughly. A little after noon we turned to and had an old-fashioned Navy "field day." We straightened up all of our gear in the basket, collected the rubbish and miscellaneous articles which we could use for ballast, and arranged things in shipshape fashion generally. We had used a third of our ballast and so there was considerably more spare room in which to move about and have an occasional stretch. The thermometer reached a maximum of seventy-four degrees.

About 1:45 P.M. we saw, far to the southeastward, a small black speck emerge from the sea of low clouds and rise slowly to about 12,000 feet. Through the glasses we could see that it was another balloon, a dark tan colored one. He stayed at approximately 12,000 feet until about 2:30 when he slowly descended and submerged himself in the clouds. After the race, we determined that he was Army No. 2. No more was seen of him or of any other balloon. We grew very hot and dry from the sun's heat, and found the last of our oranges very refreshing. We saved the orange peels, a few stale sandwiches and empty containers for ballast which we knew we would soon be using freely, with the waning sun.

* All altitudes sea level, courses true.

By 5:45 P.M., Old Sol had gotten well down toward the western horizon, was reddening and losing his heat. Our gas commenced to cool and contract and down we started. We let her come on down, using small quantities of ballast to keep her rate of descent low, as we wanted to get a good fix before dark. During the afternoon, from occasional glimpses of the ground through open spaces in the clouds, we knew that we had been making a good course somewhat north of east and at a good speed, probably twenty-four knots. Our dead reckoning placed us somewhere across the Hudson River valley in the Berkshire Mountains.

A little after six we broke through the base of the clouds and there directly below us was quite a sizable town, and another a few miles ahead. We could find no signs giving the names of the towns, but after much effort and piecing together of various bits of evidence, we determined them to be Williamstown and North Adams, Massachusetts. We dropped overboard several telegrams, each message contained in a small packet weighted by a silver dollar and with a long streamer on it to attract attention during its fall. We learned afterwards that these messages were promptly picked up and forwarded by people of the towns. These North Adamsans were not accustomed to having silver dollars drop out of the air, and one report had it that the natives were searching over the countryside for days afterwards for more such dollar-laden message envelopes. North Adams and Williamstown have always been known for their air-mindedness. However, we will appreciate it a great deal if on our next visit they will have the names of their very attractive towns painted on the tops of some of their buildings. Shortly after leaving North Adams, having accomplished our purpose, we started aloft again. Above the clouds a gorgeous sunset was being enacted —a sunset such as occurs only in Mediterranean novels and is seen only in aircraft.

Night of Sunday, May 5

We skimmed past Brattleboro, Vermont, just as they turned on the street lights. We had come up to about 6,000 feet but there was an open area in the low clouds in our vicinity. These Brattleboro lights came on all over the city simultaneously, and with a suddenness such as to startle us. It was as though in passing over the city, we had inadvertently closed the master switch.

For an hour or two we passed through the tops of a succession of high cumulus clouds and roll clouds, some of which reached up as high as 9,000 feet. We did not, however, get the bumpiness in these clouds which would be expected from their appearance. These may have been the aftermath of thunder-storm and tornado conditions which we later learned had been prevalent in the vicinity of Berlin, New Hampshire, during the afternoon of Sunday. After ten o'clock, however, we were molested no longer by these tall clouds and settled down to an ideal night's cruising. We were in dead smooth air, at an average altitude of 6,000 feet, going at what seemed like express train speed in an excellent direction, about northeasterly. The sky overhead throughout the night was absolutely clear. The myriad stars gave sufficient light to make the ground easily visible when the low clouds were absent and enough light to read our altimeter and watch without the aid of a flashlight. Polaris, with some of its adjacent constellations, furnished a constant and easy means of checking our course; we kept these stars in the corner of our eyes all night and would have known immediately had we gotten set off our course seriously.

During the early part of the night, we could see the glow from the lights of Boston far to the southeastward. All night a continual flashing was kept up along the horizon from northeast to southeast. It may have been lightning or electric railway flashing, probably both. We could make out no thunderheads or even cloud banks on the horizon, but after landing, we learned that there had been thunderstorms in Nova Scotia and Prince Edward Island during the night. This apparent lightning worried us for awhile, but we were not closing it and it was on the bearing from us where one would rather have lightning, if one must have it, so we didn't let it bother us too much. The low clouds became thin stratus with large open areas. For several hours around midnight we had practically no clouds below us. In crossing New Hampshire and lower Maine the towns were numerous. Towards morning, we were getting into the upper and wilder stretches of Maine, and into New Brunswick. This is a sparsely populated country, mostly forest

with few villages and roads. From time to time we could hear a train rumbling along on some railroad below.

It got pretty cold in the basket. We had Hallum heating pads with us; you pour a small quantity of water into one of these "gadgets," shake it up well and wait for it to get warm. They stay hot for an hour or so and then you can repeat the process.

Bushnell and I each got two one-hour periods of sleep while the other stood watch. We would heat one of the pads, one of us would settle himself on a sand bag in a corner of the basket, doubling up around the heating pad as much as possible to utilize all the calories that the thing would emit, and would be asleep practically instantly. One beauty about this arrangement was that the sleeping member of the crew would snore loudly enough to keep the one on watch wide awake. Almost on the dot of an hour, the sleeping member would wake up, all cramped and cold. He would get up, stretch himself well, feel greatly refreshed and wide awake, and much in need of a little more warmth, and the other one would turn in. It didn't get bitterly cold in the basket, the minimum temperature being thirty-six degrees, but we were not rigged for winter flying, had used up all of our hot coffee, and there is no way in a balloon to move around strenuously enough to keep your circulation.

Shortly before daylight the moon rose, presenting a weird appearance as it did so. A cream-colored, cheese-like horn shoved itself up over the eastern horizon; I was on watch at the time, and in my early-morning, half-doped mental state, I couldn't possibly figure out what this thing was. However, soon, and to my mental chagrin, it developed into the old, orthodox crescent of the moon.

Forenoon of Monday, May 6

At daylight, which was not long after three o'clock by our Eastern Standard Time, we were well over the New Brunswick line. Low clouds made up rapidly with the oncoming light and sun. At 6:30, we came down close to old friend earth to check our position. We lowered our drag-rope, which is a length of manila line about 250 feet long, hanging from the basket. Balloonists use such a drag-rope as automatic ballast when near the ground. After your drag-rope touches the ground, further descent means that more and more of the weight of your drag-rope is taken off the balloon, and conversely, a subsequent rise means that the balloon is picking up more and more of the weight of the drag-rope again. We "drag-roped" across several deserted farms near St. John River without finding any signs of life. About 7:30, we came across a man whom we hailed and who told us that we were about twenty miles from the coast opposite Nova Scotia.

We continued to "drag-rope" along, with the basket anywhere from the treetops to 200 feet above them; the basket would occasionally crash through the tops of the taller clumps of trees. Drag-roping through trees in a moderate to stiff breeze is the exciting side of ballooning. Several times we allowed the sun to pull us up into the low clouds for awhile, then we would return to the treetops, as we were approaching the coast and did not want to be carried to sea unwittingly. The wind in and below the clouds carried us in a general easterly direction, while the wind above the clouds would have carried us northeasterly.

About ten o'clock the coast line was a few miles ahead, and out beyond, across Northumberland Straits, lay Prince Edward Island. We had five and a half bags of ballast and a small quantity of miscellaneous gear usable as ballast. We naturally wanted to get out onto the island and as far easterly as possible. Thinking that the balloon we had seen the previous afternoon, or some other of our competitors, might be lurking in the vicinity, or might possibly have gotten out on Nova Scotia, we made the decision to go on over to the island. To do so, however, it was necessary to cross the straits in the steady and smooth air aloft, avoiding the possible erratic airs near the surface over the straits. So we allowed the sun to suck us on up through the clouds. We crossed the New Brunswick coast line at 10:15 A.M., keeping the balloon on a slow but positive rise. Near the Prince Edward Island shore, we attained our maximum altitude of 16,000 feet, and then started the long descent. During this, we crossed over the western horn of the island and dropped the end of our drag-rope into the water of the Gulf of St. Lawrence about ten miles off the north shore of the island.

We now cruised along towards the east-southeastward, roughly paralleling the north coast of the island, 50 to 150 feet of our

drag-rope in the water, moving along in dead smooth air at a 25-knot clip. This is one of the most pleasant sensations of ballooning one can imagine. There was a haze on the water to a depth of about seventy-five feet, which did not affect vertical visibility, but made horizontal visibility poor. The surface of the water was smooth and we passed over a number of lobster pots and nets of some kind. Our drag-rope made a wake in the water like that from a small speed boat.

Landing

Shortly before 1:00 P.M. we approached the outer sand bar in front of Savage Harbor near the eastern end of the island. We crossed the bar, then a mile or so of flat, wooded country, then saw ahead of us several farms. We had just landing ballast remaining; this together with the nature of the country ahead and weather conditions, indicated the advisability of landing then. So we picked out a farm directly in our path, valved the balloon down and landed her in the back yard, midway between the house and the barn, of Mr. McAdam, ripping the envelope at 1:05 P.M. The bag deflated right alongside the basket, the woods and barn forming a lee, and the air being dead calm where we set her down.

While approaching our landing place we noticed a number of people, mostly women and children, in the yard. As we drew closer, these people all ran into the house and when we landed the place was deserted as far as could be seen. After the balloon was deflated, I noticed some of the children looking out of the windows at the goings-on in their backyard, but none of them ventured out for quite a while. Eventually they found their courage and we had plenty of help from the people on this and neighboring farms in making up and packing our balloon for shipment. It was the first time, of course, that a balloon had ever been seen in those parts.

Thus ended as enjoyable a balloon trip as it is possible to imagine. And all balloon trips are enjoyable!

Conclusion

The people of Prince Edward Island were most kind and helpful to us. Mr. E. N. Gunsaulus, the American consul in Charlottetown, the capital of the island, rendered us valuable assistance in going through the necessary formalities incident to "clearing" our balloon and ourselves for home. He was most courteous and hospitable to us. Our short stay on the island was very pleasant and we can highly recommend "The Garden of the Gulf of St. Lawrence" to any wandering balloonists, as an excellent place to drop in.

In conducting the usual mental "post-mortem" on the flight, the following are evident: that on Saturday night we made very little distance, being stalled in northern Pennsylvania on Sunday forenoon, but by so doing, we apparently were lucky enough to stay in a narrow belt of relatively good conditions, with bad general conditions east and south of us, and localized foul weather west of us; that we made a good run to North Adams on Sunday afternoon, probably fairly close "astern" of the receding area of foul weather in that quarter; that Sunday night we made the high-speed dash into New Brunswick and were able to drop into Prince Edward Island during a relatively brief interval of fine weather, since there were thunderstorms there early Monday morning, and the weather came on thick and bad again Monday evening.

Subsequent examination of weather maps shows that on the morning of May 5, a secondary low, 29.8, was centered west of Albany and a belt of precipitation covered the western slopes of the mountains from Kentucky into Canada. The morning map of May 6 shows greatly risen pressures throughout New England.

Our time of flight was forty-three hours and twenty minutes. Our distance has been announced by the National Aëronautic Association as 952 miles. These constitute American and world records for endurance and distance for balloons of our category and some higher categories.

The day after landing we were greatly surprised to learn that none of the other balloons had gotten beyond New York State; we were the only ones who had been lucky enough to get the "breaks" in weather.

Flying Paymasters

From a Report of Brigadier General George Richards, U. S. Marine Corps, to the Major General Commandant

THE Marine Corps paymasters on duty in Nicaragua have been confronted with an old problem: how to deliver money promptly to scattered detachments in isolated localities, where the ordinary means of communication are difficult and dangerous, and sometimes next to impossible. Obviously, the men must be paid promptly or their morale and military efficiency, difficult to maintain in such places anyway, would suffer. It was clearly the duty of the officers in command to devise effective, even if unusual, methods of meeting the scheduled pay days. This they accomplished by "bombing" their outlying patrols and stations, not with TNT but with currency. The method was suggested by Captain Joseph G. Ward, assistant paymaster, U. S. Marine Corps, in 1927, and was approved by the officer in command of troops. It has since been continued with success in all localities where the necessity for it exists. The method was instituted without authority from the Marine Corps Headquarters; in fact it is to be doubted if a blanket authorization could have been given legally. However, its justification rests in military necessity, which is sometimes superior to law and regulation.

When funds are ready for delivery, the paymaster concerned ascertains from the operations officer of the aircraft squadron when an air patrol is scheduled to cover the stations for which the payments are intended. The packages containing the currency are then delivered to the flying field, receipts being given by the operations officer if in Managua, otherwise by the pilot. The operations officer keeps a record of all money-drops. The packages are accepted by the pilots for delivery at the sender's risk.

No guards accompany the plane, but a two-plane patrol is chosen if possible. Stations make their identity known to the pilots by panel, the air liaison ground code governing the methods of communication between station and plane. If in doubt as to identity, the pilot first drops a message. The packages of currency are then tied to dropping sticks, one inch square by fifteen inches long, with a cloth streamer. The plane flies within a few feet of the panel and drops the package, which ordinarily lands within ten feet of the mark. The ground unit then displays the HY panel, which acknowledges receipt of the money.

Public funds from paymasters on duty outside of Managua are accepted by any air patrols that chance to land near their headquarters. This money, if not delivered the same day, is turned over to the operations officer of the aircraft squadron in Managua for delivery by the next patrol. Because of the great amount of necessary flying, special requests for the delivery of funds have been kept at a minimum, but the closest coöperation has always prevailed between the paymaster's department and the aircraft squadrons.

Approximately seventy such deliveries have been handled during each of the past eight months. In two and one-half years more than $1,500,000 has been successfully transported by airplane, with no loss whatsoever. This constitutes a unique record, made possible by the excellent coöperation between the various units of the Marine Corps in Nicaragua. It is believed that nowhere else has such a method been so extensively employed.

Aerial Annihilation

By CAPTAIN ELBRIDGE COLBY, *U. S. Army*

WITH improved bombing planes being constructed day by day, we face the problem of aërial bombardment—the problem of war and the problem of law. If it is true that the accepted practice governing conduct in any one war becomes the standard for future conflicts, we are indeed in a bad way. The seeming extravagances of 1918 are so recent and so vivid. They are as yet the last word, simply because there are none others more recent.

But it is not always true that extreme practices become precedents for future action. I am not inclined to be so pessimistic as Mr. James M. Beck, who told the American Bar Association:

> During the World War, nearly all the international laws . . . . were immediately swept aside in the struggle for existence; and civilized man, with his liquid fire and poison gas and his deliberate attacks upon undefended cities and their women and children, waged war with the unrelenting ferocity of primitive times.

Nor do I think we can accept absolutely the opinion of other publicists that the peasant woman on her farm and the soldier on the field of battle are equally subjects for belligerent attack. International law, it is true, was tested by the equity of the sword and the truth of the rifle. But the tests were not final tests. The tests will not be complete until the last dollar of indemnity has been paid and the last remembrance gone of neutral nations rallying against the offending belligerents. There is no need for jumping hastily at conclusions and saying that the next war will be horrible war any more than there is for saying that it will be exclusively an aërial war.

We should recognize as international law not the extreme humanitarianism of the dreamer nor the wild imaginations of the applied scientists. We should recognize only what is in real life practicable and applicable, and useful and reasonable, else the man in uniform will declare to the publicists of the printed book that the regulations may be on paper, but do not jibe with facts and conditions.

Admiral Mahan's refusal to permit the United States to subscribe to an anti-gas convention over a quarter of a century ago, is an example in point. The new weapon was then relatively unknown, in its effects or its values. The proposed weapon was not "demonstrably inhumane," he said. And then why, he added, should the choking of soldiers with gas be forbidden, when it was still permissible to use a midnight torpedo to choke and drown a battleship full of sailors.

During the progress of the World War, a German writer claimed that aërial bombing "is unable seriously to further the war aim" and "can only serve to terrorize." He expressed a hope that aërial combat would vanish and that "modern war law would again confine aërial navigation and flying to the service of reconnaissance." In August, 1922, the International Law Association, meeting at Buenos Aires, declared that the radius of operations of military aircraft ought to be limited—a vain attempt to take from armies all the advantage of deep penetration into enemy areas, and from a certain type of plane the distinctive features secured from its wide cruising range. Mere theoretical attempts these, and so without value. Maturer judgment and more expert opinion at the Hague in 1923, drafted rules as follows:

> Aërial bombardment for the purpose of terrorizing the civilian population, or destroying or damaging private property not of military character or injuring noncombatants, is prohibited.
>
> Aërial bombardment is permitted only when directed at a military objective, that is to say, an object of which the destruction or injury would constitute a military advantage to the belligerent. Such bombardment is legitimate only when directed exclusively at the following objectives: military forces, military works, military establishments or depots, factories constituting important and well-known centers engaged in the manufacture of arms, ammunition, or distinctively military supplies, lines of communication or transportation used for mili-

tary purposes. . . . . In cases where the objectives so specified are so situated that they cannot be bombarded without the indiscriminate bombardment of the civilian population, the aircraft must abstain from bombardment.

These rules, it will be noted, permit bombardment practically without stint in what military men call the "theater of operations" and set up the criterion of the military objective in the "zone of the interior." It will further be noted that the articles do not say that bombs must *fall* exclusively on military objectives, only that they must be *directed* exclusively at such. They do not say that the bombardment of civilian population is prohibited, merely the *indiscriminate* bombing of such. Nor do they make the old distinction between combatant and noncombatant. They take into consideration the modern "selective service" idea and "industrial mobilization" for war, and permit attacks on factories making "distinctively military supplies." Under these rules, the old excuse of aiming at a military objective and hitting an "innocent bystander," may still be pleaded. War is not a game of tag in which an army may march into a city, or a government set up its military factories next to a town, and there "touch wood" and be "safe."

Note the words of that disenchanting British journalist with a fiery pen, Mr. C. E. Montague, who says:

When the long row of hut hospitals, jammed between the Calais-Paris Railway at Etaples and the great reënforcement camp on the sand hills above it, was badly bombed from the air, even the wrath of the R.A.M.C. against those who had wedged its wounded and nurses between two staple targets scarcely exceeded that of our Royal Air Force against war correspondents who said the enemy must have done it on purpose.

The bombing will be avowedly at military objectives. If the manpower of the nation is reduced, if the manufacturing efficiency of the country is hurt, if the morale of the foe is lowered, so much the better. But these will be only incidental values. The military commander and the strategic statesman will speak and think only of military objectives.

His reports will mention only them. The newspapers of his country will cite them and them alone. Truly, as Professor Garner has remarked:

The rules proposed by the commission undoubtedly leave a large discretionary power to aviators. To a much larger degree than in land and naval warfare, they are made the judges of the legitimacy of their attacks. They must determine in each case and with little opportunity for investigation and verification whether a particular object falls within the category of military objectives, and if so whether it is situated outside the immediate zone of land operations, and if so whether it can be bombarded without indiscriminate bombardment of the civilian population; and, finally, whether in the case of a city, town or building situated within the zone of land operations there exists the reasonable presumption of military importance required by the rule. Manifestly, the most scrupulous aviator will commit errors of judgment under these circumstances if he resorts to bombardment at all.

We cannot put too much trust upon mere rules. Not that these are so likely to be disregarded in the heat of action, but rather more that the rules are too frequently inapplicable to the changed situations which arise when the next war really comes. There were rules of war prior to 1914, and as Lord Cave has said: "No one conceived of the possibility of an infraction by civilized people of the rules laid down." Still, one nation employed a new naval weapon, the submarine, contrary to all existing laws regarding sea warfare—laws drawn up without full appreciation of the uses of the submarine. Another nation tried to starve the noncombatant population of its opponent into submission, stating that "economic pressure" would bring the foe to their knees "as surely as the winter will strike the leaves from the trees." Both belligerents extended the uses of aircraft beyond any previously imagined limitations and developed them to an amazingly new utility. A group of diplomats in Washington after the conflict tried to restrict the use of toxic and asphyxiating gases because these were deemed to have been condemned by the unanimous opinion of the civilized world; and yet their treaty has never been fully ratified and is not effective. Indeed, as Lord Cave went on to remark: "Experience has shown how little reliance can be placed upon the sanction of public opinion." We are finally thrown, possibly more than we might wish, upon the ordinary decency of the individual belligerents. And that great British authority on aërial combat laws, Mr. J. M. Spaight, has declared:

In air warfare more than its elder brethren of the land and the sea, the heart and conscience of the combatants are the guaranty of fair fighting, not any rule formulated in a treaty or in a manual.

This is not an empty suggestion. While a propagandist in Berlin and another in London are hurling abusive epithets at each

other, the British Tommy trying to pick off the German sniper, says Mr. Montague, comes to dub his foe with an affectionate nickname. He gives him cigarettes if he captures him. When a stray dog wanders across No Man's Land, his owner becomes not a brutal Boche, but simply "him that lost the dog" and a man to be sought earnestly in every open café of the occupied Rhineland, anti-fraternizing orders to the contrary notwithstanding. If I may be pardoned a personal experience, I should like to relate how after mingling with lawyers, young university liberals, and editors of the progressive "intelligentsia" who were almost unanimous in foreseeing the horrors of war and the awful destruction new weapons might accomplish, I turned to mingle with military men charged with determining military policy and methods, and found the latter thought of aircraft in a purely professional manner, as instruments to accomplish the military objective with as little loss and terrorizing as possible. It is another instance of the chasm between the theorist and the man who holds fast to facts. It is the imagination of the theorist and not the weapon of the soldier that runs wild.

The directing soldier clings to practicality and looks for tangible results. Get you a huge dirigible to bomb your enemy's city; and his swooping airplanes will bring it down. Get you a big bombing plane capable of carrying huge missiles, and swifter fighting planes will bring it down. Get you a group of bombers and a host of fighting planes to protect them on their raid and then go out to bomb the enemy civilian population centers, and what will be the practical result, from a purely military standpoint? As your raiding squadron penetrates into enemy territory its dangers become greater. Its chances of success become less. It must pass through successive lines of enemy planes and over successive sites of enemy fighting squadrons and their airdromes. Its effective force lessens as it proceeds, just as did the cavalry force of Morgan's raid in 1863, when he started with 28,000 and lost all but a few over a thousand. Then you come to bomb the city of your choice; it is provided with defensive fighting planes which can rise from the ground with fresher pilots, greater speed, and fuller gasoline tanks. It is provided with antiaircraft guns which make your raiding party keep aloft to such heights that your bombing will likely be ineffective. In 1918, Amiens was repeatedly approached by German planes which regularly turned off when the antiaircraft artillery opened on them. What matter if the guns brought down not a single plane? They had protected Amiens just as well. A Guynemer or a Richthofen might disregard such an aërial barrage; but the average flyer does not. Then your raiding planes must come home through hordes of hostile aviators roused to head them off.

The simple military fact is that the results of long-distance civilian bombardment are not worth the effort. If bombing could be continuously and effectively carried out, civilian morale might be depressed; but occasional raids and scattered bombing serve only to stimulate the foe to greater efforts against you. And if your methods are forbidden by international conventions, or even by draft conventions not yet ratified and legally effective, you will find that your transgressions will be accepted, as were those of the Germans, as a "challenge to all mankind." Your foes will be joined by increasing numbers of allies, and you will go down to as sure and ignominious a defeat as Germany did.

Is the risk worth the results? Is it sound to make such efforts for such returns? Unopposed there might be chances for big successes. But opposition will come in whining "archies," droning pursuers, and additional foes. As the world goes on, mechanical contrivances on opposite sides of the battlefield tend to counteract one another. The enthusiastic scientist makes great predictions, but the enemy scientist equalizes his achievements. In his last report as chief of staff of the Army, General Pershing said:

> During the World War, extravagant tales of havoc done to enemy cities and installations were often brought back, in good faith, no doubt, by some of our aviators, but investigation after the Armistice failed, in the majority of cases, to verify the correctness of such reports. Again, the damage done to the Allies by the enemy's bombing craft, including Zeppelins, was almost negligible even from a material point of view, certainly so from a morale point of view and in its effect upon the final results. Of course, some damage was done by aircraft bombing, and it would doubtless be somewhat greater in another war, but until it becomes vastly more probable than at present demonstrated, then it cannot be said that we are in a position to abandon past experience in warfare.

When the imaginative gentleman says he is frankly looking facts in the face and pre-

dicts an era of general bombardment in spite of treaties, conventions, and rules which indicate a public opinion to the contrary, we can at least find consolation in the military mind. I do not mean the mind of the enthusiast with his single hobby. I mean the mind of the mature strategist who will actually direct operations and issue orders in the conflicts to come. That mind is convinced of the impracticability of extensive bombing operations against civilians. That mind considers simple causes and looks for definite results. That mind places no credence in Jules Verne pictures of sheer mechanical warfare, nor upon fantastic imaginations of aërial invasions of the enemy's capital and the administration of melancholic gasses to make legislators agree to terms of peace. That mind realizes that the offense and defense develop so nearly at equal rates, that the distant bombardment of huge cities would not only be atrocious but would also be of scant value compared to the employment of the same bombs and planes in the more immediate vicinity in the theatre of operation. The principle of the "military objective" is not only a phrase in the new draft rules for aërial warfare; it is a fixed doctrine of modern military art, closely linked to the idea of the economy of force. There are railway lines nearby that can be bombed so as to disrupt or destroy the essential movement of enemy reserves. There are ammunition depots nearby in the theater of operations that can be bombed so as to cripple the effectiveness of the enemy artillery. So why waste materials, personnel, and time, in inaccurate attempts to destroy the Cologne bridges or Berlin factories?

I have said that we cannot put too much exclusive trust on mere legal rules for aërial warfare, or we shall be disappointed as to their effectiveness. But now that military men are becoming thoroughly aware of the real characteristics, values, and limitations of air bombers, we can trust to their tactical ability to hew to the line and fight for the winning of a war along sound military lines. The chief hope of the new rules lies not so much in the fact that they were drawn by a set of very distinguished jurists, as in the fact that they conform so well to the principles of military strategy and tactics. They will be applied, not by barristers before a court, but by soldiers in the field. There will be errors in interpretation and errors in commission, as there are in every war, for the principles of strategy and tactics seem to be violated almost as regularly as those of international law. Yet the rules will tend to govern just the same.

Naval Aviators Relieve Flood Victims

By COMMANDER GEORGE S. RENTZ *(Ch.C.), U. S. Navy*

HEAVY rains fell over Southern Alabama and West Florida during the second week in March until a downpour unequalled in that locality by any other on record was experienced. The rising of the rivers was watched with anxiety, as the tragic experience of 1928 were still fresh in the minds of all the inhabitants. The acting commandant of the Naval Air Station, Commander W. G. Child, who had gone through that period and the far more strenuous experience of the Mississippi Flood of 1927, was standing by awaiting the call that he knew would very likely come to naval aviation for help.

At eleven o'clock Thursday night, March 14, the telephone bell in the commandant's quarters rang vigorously. "The governor of Alabama is on the wire, sir," said the operator. The commandant roused slowly from that deep slumber which is prescribed for all good aviators six nights in the week, but brought all his energy into wide-awake action as he caught the earnest anxiety of Governor Bibb Graves's voice when he said: "The Pea River has overflown its banks and is rising rapidly. It is reported that eighteen hundred souls at Elba will be lost unless you can relieve them by seaplanes and boats tomorrow morning. Can you help them?" "We will do everything that can possibly be done," replied Commander Child.

And he meant it, although, as he explained to the governor, it would be impossible to rescue the people of Elba either by boat or seaplane from the Naval Air Station. The speed boats and motor boats could not make the trip down the coast to the mouth of the Pea River and upstream against the swift current of the swollen river; such a trip was beyond their capacity; they were not built for that kind of work. The station tug, *Allegheny,* was too large to steam up the river.

A glance at one of the illustrations of a flooded town will convince even those who know little about seaplanes how impracticable it would have been for a plane to have landed among the roofs, trees, telephone wires, and other obstructions—it just is not done in the best aviation circles by planes that hope to retain their status on the Navy's active list. Our aviators do many wonderful things, but there are certain miracles that even they do not perform. The fact that it would have been impracticable, with the limited fuel and passenger capacity of the training planes, to have evacuated the population of a town of eighteen hundred people did not matter very much as the planes could not get to the people nor the people into the planes.

As he hung up the receiver at the close of his conversation with Governor Graves, Commander Child began to convert the air station into a relief organization to help the flood victims as much as possible. Orders were given to secure all training activities equipped with planes suitable for flood relief work and to have all those planes ready early Friday morning under stand-by orders for instant action as opportunities developed for usefulness in the emergency.

Fortunately, the situation at daybreak, desperate though it was, was not quite as perilous as the first reports received by the governor had indicated. Individuals here and there were caught in the rush of water and were drowned, but nowhere was there such wholesale destruction of people as was feared for Elba, Thursday night. But short of that, the devastation was overwhelming. The Conecuh, Yellow, Pea, and Choctawatchee Rivers are rivulets compared with the mighty Mississippi, but in proportion, they flooded their valleys with a destructive violence comparable to that of the Father of Waters in his utmost fury. As the illustrations show, whole towns were engulfed and people were driven to the garrets and roofs of their houses and, in some cases, to the first high ground they could reach regard-

less of such incidentals as houses. Roads and railroads were covered with water and washed out; bridges were carried away or cut off by the washing away of approaches; telegraph and telephone wires were down in all directions. On the morning of Friday, and until Sunday afternoon, Pensacola was as completely cut off from the surrounding communities as at any time in its history—except by air.

The first call Friday morning was for planes to carry messages of warning to Geneva, Alabama, at the junction of the Pea and Choctawatchee Rivers, and to Caryville, Florida, farther down the Choctawatchee, that the floods which had submerged Elba would soon overwhelm them. It was feared that these towns might not be prepared for the unprecedented volume of water that was threatening them. The low-hanging clouds and the heavy rain to the east of Pensacola made it impracticable to reach the threatened communities during the morning, but in the afternoon two planes carried the warnings to them, returning to the air station just at sundown.

Meanwhile word was received of the plight of the citizens of Flomaton, fifty miles north of the air station on the Alabama line, and of Brewton, Alabama, fifteen miles northeast of Flomaton. At noon five planes, loaded with sacks of bread furnished by the people of Pensacola, took off from Corry Field. As no landing fields were available, the best that could be done was to resort to "bombing." Dropping the sacks of bread on tiny isolated dry spots where people were huddled required nicety of flying and skill in bombing, especially as some of the spots were roofs of houses and of trains. Of course, not all shots were direct hits, in fact some were quite "wet." But bread cast upon those waters came to its own, not "after many days," but within a few seconds as eager hands rescued the manna that fell, at least part way, from heaven. A second flight of ten planes carried more bread and later in the afternoon a third flight, also of ten planes, delivered all that remained of the day's supply. On Friday the water was higher at Brewton that at Flomaton. Seven passenger trains blocked at Brewton increased the population of that town, so the bread was divided evenly between the two places.

A survey of the flooded area by Lieutenant Commander C. P. Mason and a representative of the press in an observation plane showed that much more relief work by air would be necessary before help could be given by boat, automobile or rail. From Mobile, Alabama, to Apalachicola, Florida, and inland for from eighty to one hundred miles, the country was cut off from the outside world, except by air—and radio, but you can't send bread by radio (not yet).

On Saturday, March 16, twenty training planes continued the "constructive bombing" of the isolated communities. Potatoes and canned goods were added to the bread. They also added to the danger of the refugees, as a thirty-pound sack of canned goods dropped from a plane is pretty hot to handle without gloves. All supplies brought to Corry Field that day were sent to the hungry as soon as practicable. Clear skies made possible a wider survey, which showed that Elba and Caryville were in a position to receive supplies from nearby towns on high ground, but that Geneva was almost completely cut off.

Sunday morning four observation planes with 950 pounds of canned goods went to the help of Geneva. Falling waters early that morning disclosed the roofs of houses midway between Flomaton and Brewton. The submerged town proved to be Pollard, Alabama, whose inhabitants were marooned on a neighboring hilltop. Within a little more than two hours of their discovery, supplies were dropped to them and were very evidently received with much appreciation. Two administrative flights were made to Tallahassee and to Bonifay to carry relief organizers for the flooded area. As great anxiety was shown by local authorities at Andelusia concerning the condition of the dam at that place, a fast combat plane was immediately dispatched to investigate. Lieutenant E. C. Ewen landed near the dam, ascertained the facts, and returned with word that the dam had broken Thursday night. As the demand for bread had exhausted the supply of yeast in Pensacola, an NY (training plane) and an F-5-L (boat-type plane), flew to Mobile and returned with 700 pounds of yeast, sufficient to supply the bakers who were working day and night to provide their precious product.

On Monday and Tuesday training planes continued to carry food to Flomaton, Pollard, and Brewton, and added blankets,

clothing, and medical stores as contents of the bombs.

By Tuesday evening the waters had subsided to such an extent that people were returning to their homes and relief work was being handled locally as Army and National Guard units, Coast Guard, American Legion, Red Cross, and Salvation Army organizations reached the flooded communities by boat and automobile, so that the need for relief by air ceased.

Wednesday morning, March 20, a new need for air service arose as hurry calls for typhoid serum came. A supply that had been forwarded by plane from Virginia was lost en route when the plane met with disaster. The small amount of serum remaining in Pensacola was hurried to Caryville in an observation plane and, carefully wrapped in cotton and excelsior, was dropped with a small parachute attached. The serum supplied by the medical officer at the air station was taken to Flomaton. When further calls came early in the afternoon, a chief petty officer who heard of the need at the Red Cross office provided fifty dollars to purchase a supply in New Orleans. A Hawk was detailed for a late afternoon flight. A Parke Davis man was waiting with the package at the New Orleans airport, and the plane retuned to the air station at dusk.

During the whole period daily trips by an F-5-L, carrying 500 pounds of mail each way to and from Mobile, provided the only mail service for Pensacola and the air station. Five thousand pounds of first-class mail and one million dollars worth of registered mail were carried on these mail ships.

The only planes that could be used for the general relief work were the two-seated training and observation planes, which were capable of carrying only comparatively small loads. One hundred and thirteen flights were made, covering a total distance of about 15,000 miles. Three thousand loaves of bread, sixty cases of canned goods, twenty bushels of potatoes, one hundred blankets, twenty-five bundles of children's clothing, medical supplies, and newspapers were carried to those in need.

While the Navy planes were bringing aid from the south, the National Guard squadron at Montgomery was performing similar relief work from the north.

The people of the flooded areas were very grateful for the help given by our fliers. This relief work emphasized one of the unique values of aviation, as no other help could have reached these people during the several days that the waters were at their height.

Courtesy Commander George S. Rentz (Ch.C.), U. S. Navy

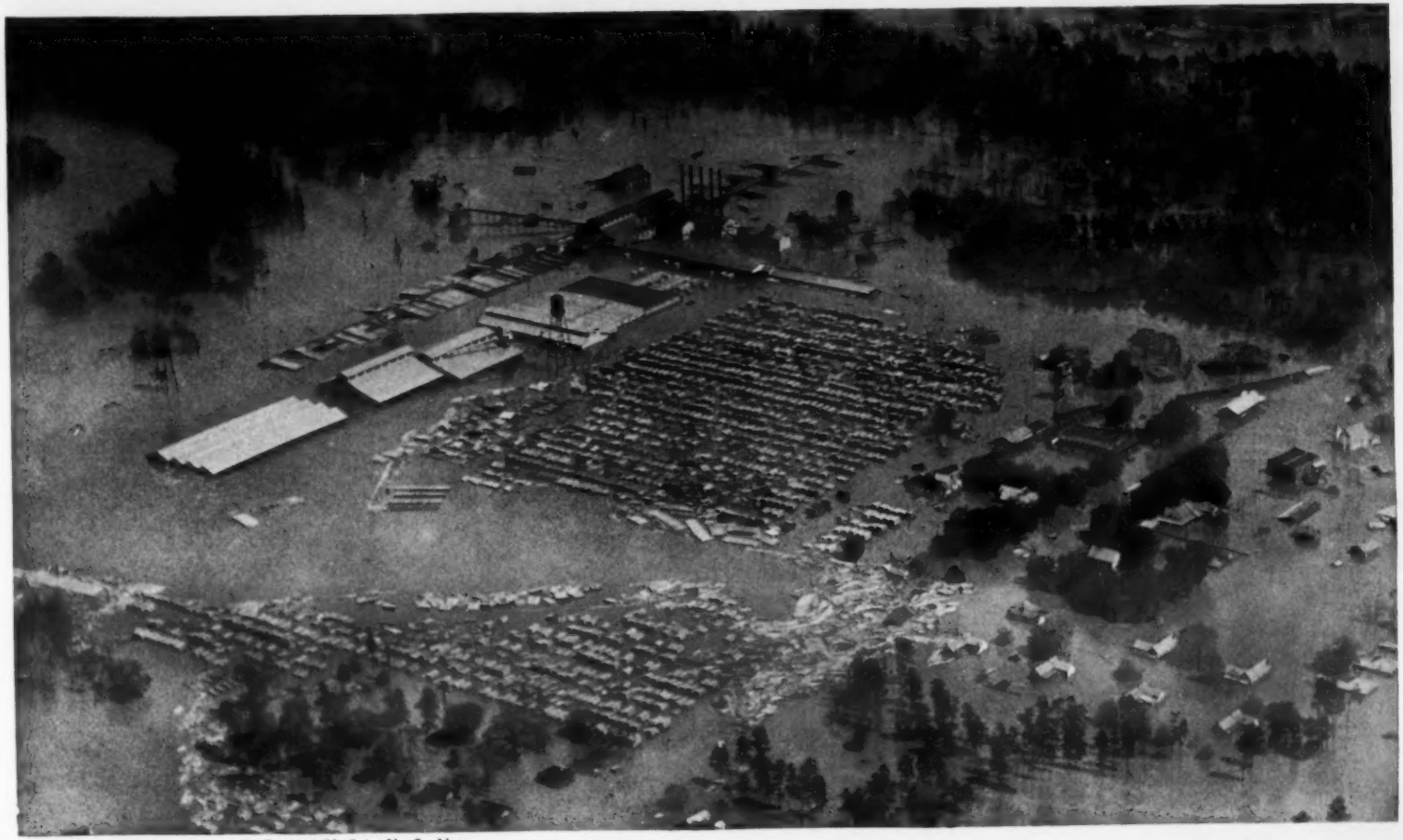
THE FLOOD SITUATION IN ELBA, ALA., MARCH 16, 1929

Courtesy Commander George S. Rentz (Ch.C.), U. S. Navy

ANOTHER VIEW OF ELBA, ALA., MARCH 16, 1929

Courtesy Commander George S. Rentz (Ch.C.), U. S. Navy

THE FLOOD AT BREWTON, ALA., MARCH 18, 1929



Courtesy Commander George S. Rentz (Ch.C.), U. S. Navy

AND THIS WAS CARYVILLE, FLA., MARCH 16, 1929

Courtesy Packard Motor Car Company

PACKARD DIESEL-TYPE AIRPLANE ENGINE

Mounted in a Stinson-Detroiter test plane. This engine promises a revolution in the cost of air transportation.

Courtesy Pratt & Whitney Aircraft Company

HORNET-POWERED BOEING MAIL PLANE

Courtesy Pratt & Whitney Aircraft Company

WASP LOCKHEED AIR EXPRESS IN WHICH CAPTAIN F. M. HAWKS MADE A NEW TRANSCONTINENTAL NON-STOP SPEED RECORD
Flying from Los Angeles to New York in eighteen hours, twenty-two minutes.

Courtesy Pratt & Whitney Aircraft Company

FORD TRI-WASP PASSENGER TRANSPORT

Courtesy Pratt & Whitney Aircraft Company

CAPTAIN IRA BAKER FLYING A WASP-POWERED BOEING OVER KELLY FIELD

Courtesy Sikorsky Aviation Corporation

THE SIKORSKY TWIN-MOTORED AMPHIBION

Courtesy Sikorsky Aviation Corporation

SIKORSKY AMPHIBION IN THE AIR

Courtesy Sikorsky Aviation Corporation

VIEW OF CABIN OF THE SIKORSKY AMPHIBION
All the comforts of home!

Courtesy Boeing Air Transport System

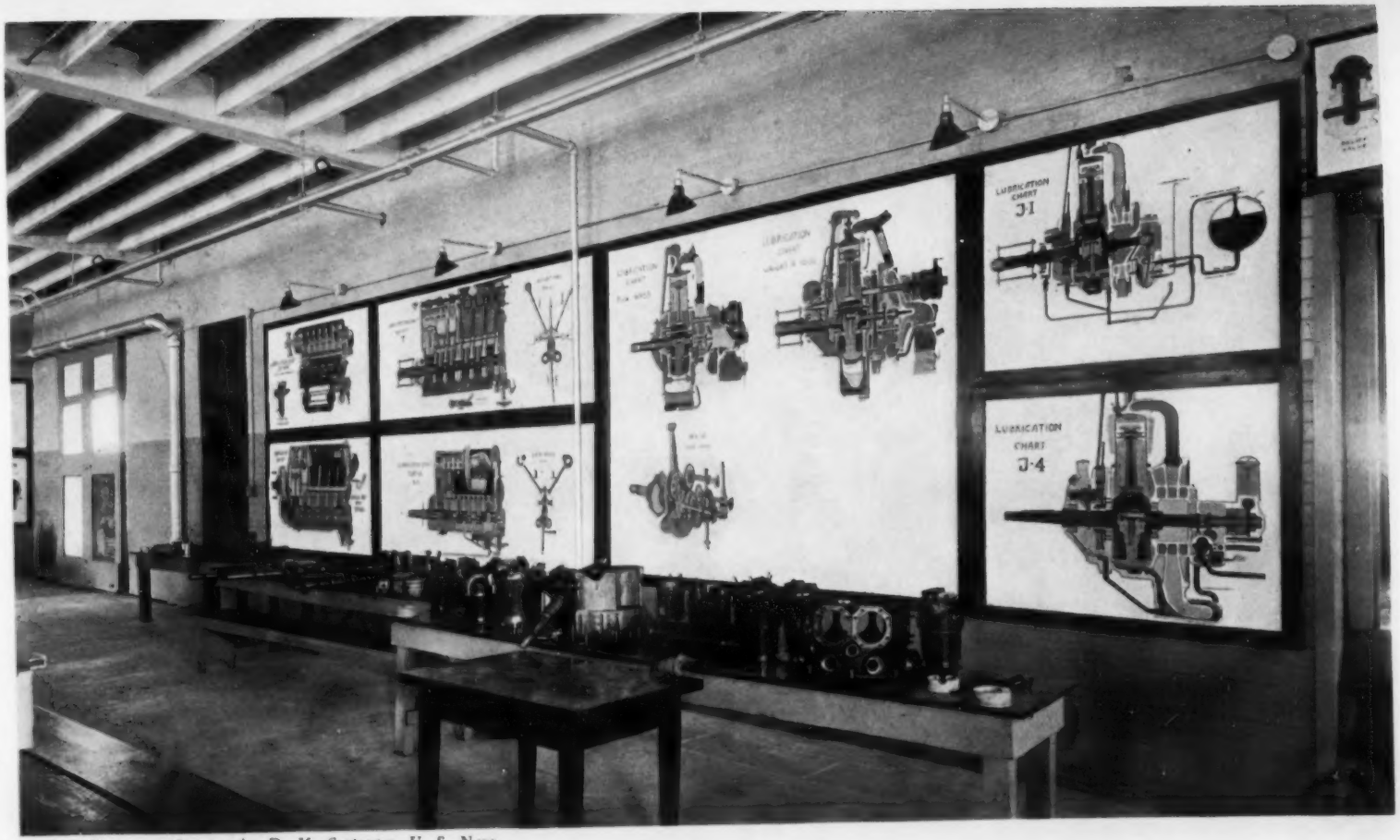
A BOEING PLANE FOR THE CIVILIAN FLYER

It has the performance of a military plane—speed 165 miles an hour and can climb to 24,000 feet at the rate of 2,400 feet a minute.

Courtesy Wright Aëronautical Corporation

THE NEW FOKKER FLYING BOAT
Powered with a Wright Cyclone 525-horsepower engine

Powered with a Wright Cyclone 525-horsepower engine



Courtesy Lieutenant Commander D. M. Carpenter, U. S. Navy

CHARTS OF AIRPLANE ENGINES, USED IN INSTRUCTION OF STUDENT AVIATORS AT PENSACOLA

Courtesy Lieutenant Commander D. M. Carpenter, U. S. Navy

STUDENT AVIATORS AT PENSACOLA

Progress *at* Pensacola

By LIEUTENANT COMMANDER D. M. CARPENTER, *U. S. Navy*

SEVERAL articles have appeared in the U. S. Naval Institute PROCEEDINGS during the past few years describing naval aviation training. However, the very considerable changes in training organization, methods covering other than strictly flight training, and in training schedules, would seem to warrant an attempt to convey to the service at large, a comprehensive and up-to-date view of what Pensacola is now doing and how it is done.

Until recently, flight training was conducted by a class system, in which all members of a class commenced training simultaneously. The first part of flight training is known as the dual period, during which an instructor rides in a plane with his student, acts as safety pilot to eliminate possibility of accidents, and coaches the student in his work. Not more than one hour a day of such dual instruction can profitably be given to inexperienced students. Even this small amount of flying produces distinct fatigue in the novice. Likewise, long experience has demonstrated that a flight instructor cannot be expected to make more than four dual instruction flights, of one hour each, a day. At first blush, this does not appear to be a very strenuous working day, but that will bear further investigation. Aside from the fact that flight instruction is extremely arduous and tries the patience and endurance of even the strongest, we must remember that four hours of flying, in one-hour increments, requires considerably more than four hours of total elapsed time. Time spent in getting into the plane, warming up the engine, taxiing to the point of take-off, taxiing as necessary after landing, refueling the planes between flights, instruction talks to students between flights, etc., all consume minutes which are not credited as flight time, yet none the less serve to make the instructor unavailable for other duty. We thus derive two major premises upon which to base succeeding discussion:

(a) No student, during the early stages of training, should receive more than one hour of dual instruction per day.

(b) No instructor can make more than four one-hour dual flights per day.

After ten hours of dual instruction, each student is checked for solo, or in other words examined to determine whether or not he is proficient enough to be trusted to fly alone. About two out of every ten students fail to pass this examination and are forthwith dropped from training. About three others also fail to pass at this time, but are considered promising enough to warrant assignment of three additional hours of dual instruction to be followed by another check for solo. At the end of this period of grace, it is usual to have another member of the original ten fall by the wayside, thus reducing the number of survivors to seven.

With the class system of flight instruction in effect, each instructor was given an initial assignment of four students for training. Dual instruction, up to check for solo, requires about three weeks elapsed time to finish. This time depends entirely upon the weather and naturally is somewhat longer in winter, when bad weather is prevalent, than during the excellent flying conditions of summer months. At the end of the dual period the attrition discussed in the preceding paragraph resulted in an appreciable reduction in the work required of the instructor, as each would average a loss of one of his original four students. Further attrition took place later, the final total reaching about forty per cent in the case of officer classes and fifty per cent or even more for classes made up of enlisted men. By far the greatest factor in reducing work for instructors, however, was and is the fact that students do most of their flying alone after they have completed the dual period. Instruction flights thereafter occur on the average of once to about every five hours of solo practice by the student. Without going into too

much detail in deriving figures, it is sufficient to state that instructors were required to fly about fifteen hours per week during the first three weeks of training for each class, and less than four hours a week thereafter.

Fifteen hours a week is undoubtedly a stiff assignment of flying when the nature of the work is taken into account. Mental strain is vastly increased by the fact that the instructor must allow the student to do as much as possible of the flying and ordinarily can content himself only with rescuing the plane from trouble. Jovial dispositions become soured on a continued diet of riding with students who are unbelievably awkward in accomplishing maneuvers which are second nature to the instructor. It is probable that few, if any, could endure fifteen hours per week of elementary flight instruction for month after month without interruption. The problem is aggravated, too, by the fact that this initial period is the hardest part of the entire instruction course because students do not then know even the most rudimentary essentials of flying. It is believed that ten hours a week, or even as much as fifty hours a month, is not an unreasonable assignment of work for a flight instructor; but that is about the best pace which could be continued indefinitely without staleness. If this be true, it is evident that instructors were working under overload conditions when required to fly for fifteen hours a week. We shall discuss this more in later paragraphs.

Three years ago, Pensacola was receiving two classes a year at six-month intervals. Each class comprised about sixty students. Somewhat more than two years ago, a desire on the part of the Navy Department for increased output resulted in successive enlargements of entering classes until a maximum size of about 125 was reached. This class required more than thirty instructors, at four students each, and proved a sizable lump for Pensacola to swallow. The number of instructors then on the station was not sufficient to meet the need and several officers having administrative assignments in the station organization were temporarily pressed into service as instructors to get the class safely through the dual period. Worst of all was the plane situation. Larger numbers than ever before were needed in each squadron, only to stand idly by when the class had passed to the next. To obviate, to some extent, this idleness of expensive equipment, to eliminate shifting of enlisted men from one squadron to another with shifting of operations, and to reduce classes to more manageable size, the station then modified organization and schedules to receive four classes a year instead of the previous two. Elementary flight training, demanding individual flight instruction required about twenty-three weeks to complete. The new classes starting at the beginning of each quarter would thus overlap, but by close adherence to schedule, conflict of classes in any one squadron could be avoided.

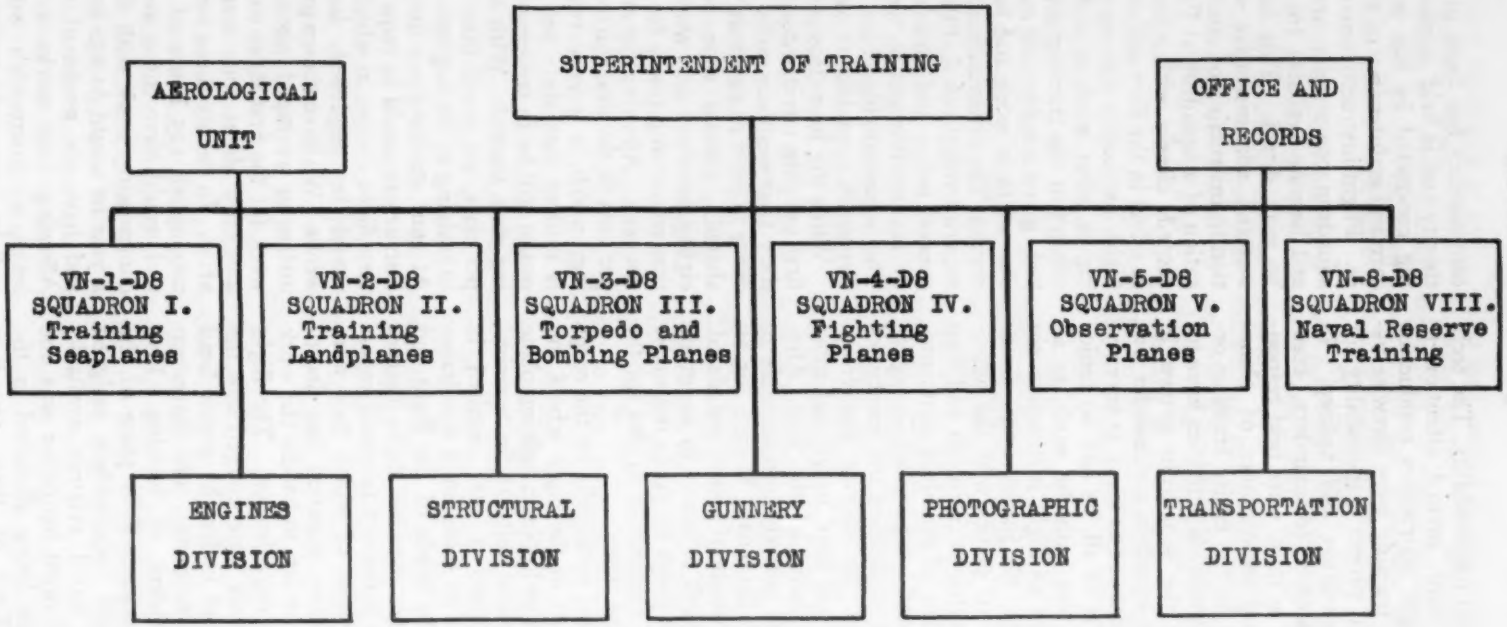
Weather interference is always apt to play havoc with training schedules and with little leeway between classes it became necessary to devote closer attention to administrative problems in order to prevent clogging the training machine with two classes in the same squadron at the same time. The organization was revised to reduce overhead to the minimum and thus release aviators from administrative assignments to permanent employment as flight instructors. Five office organizations, superintendent of training, operations, senior squadron commander, ground school, and gunnery school, were merged into one. This resulted in some reduction in necessary office force for the time being, and in considerable improvement in ease of administration. The captain of the yard assumed general supervision over training, thus obviating the need for a superintendent as a separate coördinating head. All elementary flight training plus care of aviation material was vested in an officer in charge of flight school and all remaining training in an officer in charge of technical school. These two worked side by side in adjoining offices with marked improvement in liaison compared with former conditions involving more scattered authority.

This organization remained in effect for about eighteen months and was admirably suited, in most ways, to handle training. It had, however, a very serious fault which it shared with all organizations which preceded it. Anxiety to produce the best possible results with students had obscured the problem of proper care of material. The flight school accused the technical school of using planes without the logical consequence

of definite material responsibility. The technical school, in turn, invited attention to the fact that flight instructors conducting elementary flight training were likewise using planes without proper responsibility for their material condition and upkeep. In short, three squadron commanders, comparatively junior in rank, were held responsible for care and maintenance of planes which were used by the entire training organization. As Pensacola activities have increased, so have the squadrons grown in size, until a single squadron commander was charged with the care of as many as seventy-five planes. Worst of all, he had no junior officers to assist him with the work, as all such were detailed as flight instructors not in any sense under his jurisdiction. Compare this number of planes with the allowance of the *Lexington* or *Saratoga* and then think of the number of squadron commanders—of rank and experience—assigned thereto. This, not to mention the number of junior officers in the carrier squadrons. Pensacola planes get hard usage and more flying than any planes of the fleet. Altogether it appeared entirely unreasonable to expect one young lieutenant to care for an entire carrier allowance of planes unassisted, and then to add insult to injury by assigning these planes to be flown by pilots not under his command nor responsible to him for the treatment accorded them.

Planes were used principally by the corps of flight instructors of the flight school and by the gunnery, torpedo-plane, fighting-plane and observation-plane units of the technical school. Four classes a year resulted in operating by most of these units simultaneously. Neither the heads of the flight and technical schools nor the chief flight instructor could give the necessary personal supervision to all activities of which they were in charge. It became apparent that decentralization was in order, to handle the work of the expanding organization. The flight and techincal schools were merged into the training department under the senior head of the two old departments, who thereupon became superintendent of training. Five squadrons were organized in place of the previous three and commanders assigned from the senior naval aviators available. The former chief flight instructor was one of these, his office being abolished in the reorganization. Each of these squadron commanders has been given necessary authority and is held responsible for all training conducted by his unit as well as for care and maintenance of material used therein. Flight instructors necessary to assist the squadron commander are assigned to him and become available for squadron duty as he may direct. This includes upkeep of material, administrative work, etc., in addition to instructing of students. The organization of a squadron at Pensacola therefore, accords closely with squadron organization in effect in the fleet and officers attached for flight-instruction duty receive valuable training in other work as well. Other division officers of the training department are similarly given considerable authority in the conduct of their work and held responsible for results. The organization is so large that the superintendent can do little more than direct general policy and must needs leave details of accomplishment to his division officers. The accompanying chart gives a picture of Pensacola organization as now existing.

When the four-class-per-year system was first put into effect, classes were planned at sixty-four members each. The previous tendency to grow to awkward size continued unabated. Classes soon reached a size of eighty members and word reached the station concerning plans for classes of eighty-six each. Allowing for an attrition of forty per cent in the first thirteen weeks of training, which is a very reasonable figure, it is evident that sixty per cent of one class would still be in training when the succeeding class started. With eighty-six students per class, we would then have 138 students in training at the beginning of each quarter. At four students per instructor, thirty-five instructors would be required. The elementary flight course, in which these instructors would be employed, lasted twenty-three weeks. We have shown previously that each instructor averaged about fifteen hours a week for the first three weeks of this period and only about four hours a week thereafter. In twenty-three weeks he would thus accomplish 125 hours of instruction flying and would have three weeks' layoff before commencing work with the next class. In a year he would do 250 hours of instructing and have six weeks of unemployed time. Allowing four weeks a year for routine leave, an instructor's working time could well be forty-eight weeks instead of forty-


SUPERINTENDENT OF TRAINING
AEROLOGICAL UNIT
OFFICE AND RECORDS
VN-1-D8 SQUADRON I. Training Seaplanes
VN-2-D8 SQUADRON II. Training Landplanes
VN-3-D8 SQUADRON III. Torpedo and Bombing Planes
VN-4-D8 SQUADRON IV. Fighting Planes
VN-5-D8 SQUADRON V. Observation Planes
VN-8-D8 SQUADRON VIII. Naval Reserve Training
ENGINES DIVISION
STRUCTURAL DIVISION
GUNNERY DIVISION
PHOTOGRAPHIC DIVISION
TRANSPORTATION DIVISION

six. At ten hours a week, which is believed an entirely reasonable working assignment, the instructor could accomplish 480 hours of dual flying a year. This is almost twice the useful work obtained from instructors with the class system of training. It is evident that the class system inevitably resulted in a considerable amount of idleness. This has always been one of Pensacola's major problems and became of increasing concern as the staff of flight instructors was enlarged. Obviously, the cure was to be found by devising some method of eliminating the excessive effort required during the first part of the course and substituting therefor a normal sustained effort which should not be beyond the capacity of the instructing force. The curves of effort could be smoothed out by eliminating classes altogether and instituting a continuous production system whereby students would be received at a constant rate from week to week. Graduation, of course, would then naturally follow at the same relative rate. This would result in having some students undergoing training in every part of the course in an even spread; Mr. Ford's assembly line, so to speak. Some action in this direction was imperative, as a nearly fifty per cent loss of usefulness in an ever larger group of instructors was becoming intolerable.

Two major objections were offered to adoption of such a continuous production of training. In the first place, it seemed that the fleet might oppose a program requiring detachment of officers and men at odd times throughout the year. Secondly, academic training and other non-flying activities cannot be conducted efficiently on a continuous production basis. Students must be assembled into classes for this type of work, else it would involve a greatly aggravated case of the individual tutor system inevitably required for flight training. For years, then, classes had come and gone; classes for convenience in handling non-flight activities when obviously inconvenient and inefficient for flight training. It will be necessary to digress somewhat at this point in order to indicate the steps leading up to breaking of this tradition.

The instruction problem at Pensacola differs considerably from that at most other institutions of learning. It is freely admitted, by all concerned, that theoretical knowledge concerning various phases of aviation work is of considerable importance to the graduate. This admission, however, is almost entirely in the abstract. As a concrete proposition there is a marked tendency to assume that any officer who has graduated from the Naval Academy can gain all necessary knowledge of theory without difficulty. The sole criterion of his suitability for aviation work will therefore be his skill as a pilot. This assumption is well borne out, in a certain sense, by the fact that almost 99.9 per cent of those who have failed at Pensacola have done so because of inability to measure up to the required standards in flying. Therefore, the tendency of the average student, and of the average administrative organization as well, will be to devote major effort to flight work with the assumption that other necessary qualifications can easily be obtained later. Flying, moreover, partakes of the nature of a game which is hugely enjoyed by its participants. Students look forward to their daily stint in the air, not as to an assignment of work to be accomplished, but rather as to an opportunity to indulge in an enjoyable exercise. Indoor work, on the other hand, especially if of an academic nature, often proves to be very much of a bore. This differs in no wise from the psychological reaction of the usual schoolboy, whose day of real living does not begin until released from the classroom to the pleasures of the athletic field.

The purpose of all training at Pensacola, other than that designed solely to develop flying skill, is to inculcate a knowledge of aviation material, with its use, care, operation, maintenance and overhaul, such that graduate students will be able at once to enter upon really useful employment upon being assigned to operating units. Once having learned to fly, students are more apt to appreciate the value of this part of the training course. However, it is manifestly impossible to wait until students are otherwise ready for graduating before taking up the problem of their technical education. Actual time in the air for each student will vary from one to three hours per flying day, the larger time allotments coming during the later stages of the course. Students are therefore available for employment in some non-flight activity for an average of somewhat more than half of each day

throughout the course. The length of time necessary to complete flight training is accepted as the measure of the time that students are retained at Pensacola and the course in non-flight subjects is adjusted to absorb all student time not spent in actual flying.

The efficiency of academic training is undoubtedly somewhat reduced, due to students centering their major interest in flight work, as discussed above. For this reason, if for no other, considerable attention has been devoted to the problem of enlivening academic work to hold student attention. A strictly practical course is to be desired. Dry theoretical discussions are to be avoided. Pensacola attempts to develop practical operators and not designing engineers. A certain amount of theoretical work is unavoidable in order to lay a proper foundation for intelligent practical operation. It seems entirely trite to state that a combination of study and practice is the ideal way to master any subject. Lack of proper equipment and facilities at Pensacola had resulted in developing a mode of instruction wherein much more attention had been devoted to academic study of technical subjects than to actual practical application of the results of such study. A description, in textbook or by lecture, of how to cover a wing panel with fabric, becomes dull, dry and boresome, in spite of the best efforts of the instructor to the contrary. When students can do the actual manual labor themselves, however, the subject attains life. Nearly every man has an inherent desire to accomplish things with his hands. When faced with the actual job, students want to cover that wing panel correctly, to turn out acceptable workmanship and to understand why the particular method specified is necessarily the most desirable. Best of all, the appearance and feel of material, with visual observation of all stages of construction, tends to impress pertinent points on the student's mind in a way that textbook and lecture instruction cannot hope to do.

A small amount of practical work, principally on engines, had always formed a part of the training course at Pensacola. This, however, was entirely in the way of laboratory employment. It was felt that more interest in the work would be developed and more benefit derived if the laboratory employment could be supplemented by a certain amount of actual practical overhaul on service equipment, which could be put into operation when the overhaul was finished. It is obvious that comparatively unskilled student labor cannot accomplish operations requiring years of training and experience to develop the requisite manual skill. However, by selecting suitably experienced instructors who can lend a hand when necessary, it is possible to accomplish perhaps ninety-five per cent of necessary work with student labor. The remaining five per cent, demanding a high degree of skill to accomplish, can then be done under direct observation of students so that they can understand the processes involved even though actual performance of the work is beyond their capacity.

With these ideas in mind, a plane and two engines which had been designated by the squadrons as ready to overhaul were assigned to a class of students which entered training about a year ago, with the understanding that members of the class should complete the necessary major overhaul and fly the plane before graduating. It would be impossible to conduct such work in the station shops without serious interference with regular work. Space was therefore assigned in the school buildings and work commenced. Facilities and equipment were entirely inadequate but one cannot learn to swim by remaining on dry land. No time was available for this work except bad-weather hours when students would otherwise have been flying. This delayed progress considerably, as much time was lost in resuming operations after long periods of fair weather. The general results, however, were even better than had been anticipated. The interest shown was most gratifying. The quality of workmanship was very fair. The problem of utilizing bad-weather time appeared to be solved in a very satisfactory way.

Nevertheless, inclement weather alone did not provide the amount of time considered desirable for practical work and a general survey of the training course was made to locate possible sources of additional time. Students cannot fly for eight hours a day, nor for six, nor four. Their actual average is about two hours per flying day and they do not fly during bad weather. The program of non-flight activities is designed to care for all time of students when not engaged in flying—and cannot exceed this time

allowance. Records showed that students had been assigned to squadrons for flight activities for considerably more hours than had been spent in actual flying. In the later stages of the course, during the so-called advanced training, students were assigned to flight activities for an entire day and yet were accomplishing not more than about three hours of flying. This indicated a considerable amount of stand-by time and led to the conclusion that half-day assignments, with intelligent scheduling of work, would not reduce the amount of actual flying accomplished and yet would allow of other employment during the half day saved. A general revision of the course was therefore mapped out with the purpose of making use of student time which formerly had been wasted. In outlining the new course it was discovered that some items could be considerably reduced over former practice without material sacrifice of efficiency. It so happened that revision of the training course, revision of the training organization, and allocation of additional time to practical overhaul work were all considered together and served to disclose a possible method of conducting flight training on the desirable continuous production basis.

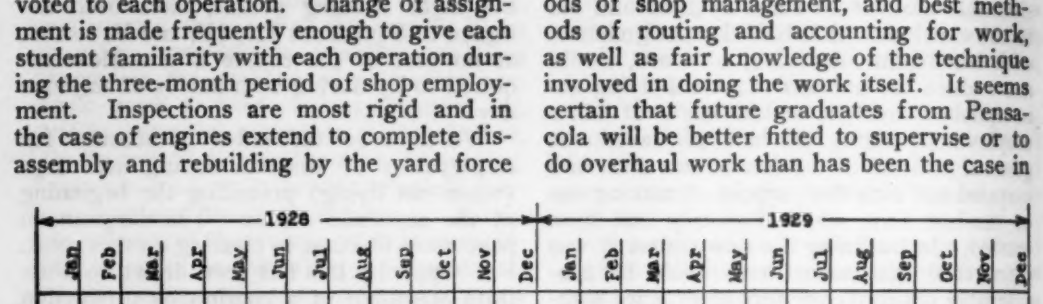
The number of flight instructors available indicated that about 480 students per year could be handled through the course with an average of about ten hours of dual instruction flying per instructor per week. (This figure took into account an allowance for absence of instructors due to leave and sickness.) It was therefore proposed by the station and approved by the Navy Department that students report to the station and enter training at the rate of ten per week for forty-eight weeks in each year, thus leaving four weeks per year leeway in which to take up any slack which might develop. Students are started in flight training immediately after reporting and progress through to graduation independently of any class organization. At the beginning of each quarter, however, all students who have arrived during the preceding quarter, have successfully passed the check for solo, and continue to make satisfactory progress in flight training, are assembled into a class for academic training. It is thus evident that Pensacola still handles four classes per year from this standpoint but that these classes are assembled by weekly increments throughout a three-month period instead of simultaneously at the beginning of the academic course as formerly. Students taking academic training are in various stages of flight training but as each type of training occupies their time for only half of each day, no difficulty is experienced. Gunnery, bombing, navigation, and radio, which formerly required flying additional to that of the flight training course, have been assigned to Squadrons III, IV, and V, so that at no part of the course is a student required to fly during both halves of any one day.

We have so far failed to account for employment of students during half days (when not flying) preceding the beginning of the academic course. The diagram on page 700 will assist in clearing up this point. For simplicity this has been drawn to illustrate operation of a continuous production system with students entering in monthly increments instead of weekly as is actually in effect. This diagram covers only the training of officer students in order to avoid possible complications in attempting to indicate the abbreviated course given to enlisted men. The same general system of training applies to both so that the simplified diagram is ample to illustrate the principles involved. Four classes of entering students per year are shown as *A*, *B*, *C*, and *D*. These classes enter in increments *a*, *b*, and *c*; *d*, *e*, and *f*; etc. The total length of the flight course is ten months. The length of the academic course is seven months, as indicated between the heavy vertical lines for each class. Time not included between these vertical lines amounts to three months for each increment. It precedes the academic course in the cases of increments *a*, *d*, *g*, and *j*, and comes partly before and partly after the academic course for other increments. During this three-month period students have no academic work to accomplish, but instead are employed in the school overhaul shops. These shops then, are reservoirs for otherwise unemployed students and as such have served to make continuous production training a possibility.

The objection will at once be raised that students, in some cases, must complete their practical overhaul work before making any academic study of the problems involved. True enough, but every training course must be a compromise. Students get more benefit

from practical work after studying theory and also, please note, vice versa. In the long run, choice between the two methods must be very much of an even break. New students are first assigned to shop operations requiring only unskilled labor. More exacting work is required after longer experience. A card record is kept for each student showing the number of hours devoted to each operation. Change of assignment is made frequently enough to give each student familiarity with each operation during the three-month period of shop employment. Inspections are most rigid and in the case of engines extend to complete disassembly and rebuilding by the yard force even though tested and passed by the students.

The quality of workmanship is suprisingly high, due perhaps to the fact that time is an element of minor consideration. The schedule now in effect shows a probability of turning out twelve planes and thirty-two engines per year from the school shops. No claim is made that graduates are skilled workers on each operation but it is contended that a very fair working familiarity is gained with each operation involved. Above all, satisfactory standards are impressed on the student's mind so that thereafter he knows what to look for on inspections and cannot be easily misled by faulty workmanship. Blackboard talks in this connection from time to time tend to emphasize pertinent points and when interspersed throughout practical work periods, seem more interesting to students than longer periods of uninterrupted lecture. Although greatly enlarged and improved over the initial layout, the shops are still in a state of development. Eventually it is hoped that they will be completely modern and up-to-date in all respects and conducted in such a way that students may absorb correct ideas concerning proper facilities, approved methods of shop management, and best methods of routing and accounting for work, as well as fair knowledge of the technique involved in doing the work itself. It seems certain that future graduates from Pensacola will be better fitted to supervise or to do overhaul work than has been the case in the past. It is to be hoped that this increased training may reflect itself in decreased maintenance costs when fleet squadrons have been well leavened with graduates who have had the advantages of present training methods.



A word now as to the revised flight training course. No material change has been made in the training conducted by Squadrons I and II. This part of the course is designed solely to teach the student to fly and requires about four months. Students thereupon proceed to Squadron III, where officers train for about two months and enlisted students only one. The first month of this training is devoted to flight work in large twin-float seaplanes, followed by the gunnery and bombing practice required of a torpedo-plane squadron. The second month is devoted to tactical work of torpedo-plane

units. Enlisted students do not take this part of the training but instead report to Squadron V.

After completing work in Squadron III, officers take fighting plane training in Squadron IV. The work of this squadron requires a type of flying for which all pilots are not qualified. It is desirable, however, that all officers attain a basic familiarity with the tactics of fighting planes and all officer students are therefore carried through this work as far as it proves safe for them to go. At the end of about one month of work in this squadron it is usually found necessary to eliminate some students who are thereupon directed to report to Squadron V. No enlisted students are now trained in Squadron IV.

A large part of the work of Squadron V is radio training in connection with spotting for ship's gunfire. Enlisted pilots will never be called upon for such work so that their training in Squadron V consists only in covering the work which will be required of pilots (as distinguished from observers) of observation planes. This requires only about one-fourth the number of flight hours demanded of officer students, and enlisted men graduate from this squadron and from Pensacola when such work has been completed.

The professional knowledge demanded of aviation personnel has been vastly increased during recent years. During the war the demand was for flyers and, in effect, for flyers only. Only the most rudimentary attention was given to acquisition of particular knowledge concerning care, maintenance, and operation of material. Aircraft tactics in the modern conception were unknown. Even flying skill was sacrificed in the urge to quantity production. Students were then graduated from Pensacola with as little as twenty-five hours of flying as compared with something over three hundred required in the present training course. Pilots with such meager training proved more of a liability than an asset to active units. Even with the reduced standards of efficiency inevitable in time of war, it proved necessary to give such pilots additional training before entrusting them with active service missions. However, all hands engaged in aviation activities at this time were distinctly pioneering. Increased knowledge and skill came naturally with extended experience. But the school of experience conducts a slow, expensive course. If active units are to progress in their work, they must be relieved of the necessity of interrupting such work from time to time to conduct the training of new arrivals. It is therefore the function of Pensacola to revise the training course as necessary to keep abreast the development of service squadrons. With this end in view, the course at Pensacola has been enlarged and improved many times as necessity demanded. Until about six years ago, training was conducted entirely in seaplanes. Necessity for development of landplane pilots in connection with carrier operation appeared at this time and a short course in landplane training was instituted as an adjunct to the regular course. Shortly afterward, further additions appeared in the way of the so-called "advanced courses."

These were concessions to the need for more technical and professional knowledge on the part of newly fledged pilots. Mere ability to fly, combined with a smattering knowledge of aërial gunnery, aërial navigation, radio, etc., was no longer sufficient to make the graduate student suitable for immediate assignment to an active unit. Upon completion of elementary flight training, therefore, members of each training class were divided into three groups for advanced training. The size of the groups depended upon the immediate needs of the service for pilots of a certain type and assignment to groups was made after due consideration of psychological qualifications, flying skill, etc. Groups were then given advanced training in torpedo, fighting, or observation planes for a period of about two months. Thereafter the graduates were assigned to duty as the exigencies of the service demanded. It was the avowed purpose of the advanced courses to prepare students for a certain type of squadron, but these same exigencies only too often demanded assignment of graduates to work for which they were not prepared.

Several other objections became evident in this specialized system of training. Pilots selected for fighting-plane work began to consider themselves the pick of the aëronautical organization, whereas many individuals, fully as competent from the standpoint of flying skill, had been selected for training in other types of work on account of more

general adaptability. Again, every plane is potentially subject to attack by any other, or perhaps liable to be called upon to attack any other. Defense and attack tactics are therefore equally important and for maximum efficiency every pilot should have a general familiarity with the tactics of every type of squadron. This generalization applies with equal force from the standpoint of coördination of effort of various types of aircraft operating in conjunction. Moreover, the best of judgment is subject to material error at times. No matter how carefully the aptitude of pilots is considered, it is impossible to forecast proficiency in advance of actual training.

For these reasons, all officer students are now given all three types of advanced training and relative proficiency for each is determined upon completion. Undoubtedly the end product is then better for assignment to *any* duty. Added flexibility for assignment is gained, at least, for the majority of pilots are found qualified for detail without restriction. Increased efficiency in conducting training has made this complete course possible without retaining students at Pensacola longer than under the previous method. Far more flying per student is done than formerly, but this only serves to bring the student up to a closer parity with other members of the active squadron which he will join. It is fully realized that the ideal of turning out students who will meet fleet standards in every respect is impossible. Still, the closer this ideal can be approached, the less will be the interruption to work of active squadrons due to diversion of effort to training. Likewise, the less will be the ultimate cost to the aëronautical organization.

To sum up then, Pensacola is now accomplishing the training of about four times as many students as three years ago. Each officer student is getting a complete course of training as compared with the limited and specialized courses of three years ago. Both officers and enlisted men are getting more thorough training, both in flight and non-flight subjects. A more efficient use of instructors' time is in effect. More training per unit of instructors, time, men, money, and planes is being accomplished. Lost motion has been eliminated in that there are now no stand-by periods between classes. The nervous strain of peak loads on the instructing staff has been eliminated and is replaced by a steady output, not beyond the normal capacity of any otherwise acceptable instructor. Peak loads in the overhaul shops have likewise been eliminated. The station is operating on a basis that permits increase or decrease of input and output with a minimum of difficulty. We may hazard the statement that it is emerging from the period of development into one of stabilized production as befits an established industry.

Naval Academy Flying Squadron

By LIEUTENANT J. F. GILLON, *U. S. Navy*

JUNE of the present year marks the beginning of a new aviation policy at the Naval Academy. For the past three summers the graduating class has remained at Annapolis to complete a course in the fundamentals of naval aviation. The actual flight training was conducted by an operating squadron which was temporarily detached from its duties with the Scouting Fleet and which was assisted by the aviators attached to the Academy.

Under the new aviation policy, an air unit which is expected to be a permanent part of the Naval Academy organization will conduct flight drill periods during the academic year. This change in policy should prove to be most advantageous not only to the flight indoctrination of midshipmen but also to the efficient operation of the flying squadrons.

The flying unit in the past took no part in the ground-school training of the midshipmen. This instruction was conducted by officers regularly attached to the Naval Academy and consisted of a comprehensive course in theory of flight, aërology, structure and rigging, aviation engines, radio and navigational instruments, aircraft communications, radio-code practice, aërial navigation, gunnery, bombing, scouting, combat and flight formations.

Time was allotted to each of these subjects in accordance with its relative importance. The respective subjects were taught and practical drills held by the proper department. The Department of Engineering and Aëronautics conducted the training in structure and rigging, airplane engines, test stand, trouble shooting, and engine overhaul. The Department of Seamanship and Flight Tactics covered instruction in aviation history, aërology, aircraft communications, and aviation scouting. The courses in the different departments were supplemented by a series of general and special lectures on aviation subjects by prominent aviators.

The flying squadron's mission was to give the graduates as a part of their general naval education an understanding of the fundamentals of aviation. Each midshipman had approximately eight hours in the air. This training consisted of one or more flights in which the midshipmen were given practical work in navigation, gunnery, bombing, radio, and engineering. Actual flight instruction, that is, handling of the controls, was not attempted. Teaching a student to fly a plane is one of the missions of the flight school at Pensacola, just as instructing an officer to dive a submarine is the function of the submarine school at New London.

Many naval officers, however, believe the flight course did not benefit the student ensigns. Certainly no student became a proficient aërial navigator, expert gunner, or reliable radioman, with just a few hours in the air. His navigation hop perhaps took him to Baltimore instead of to Greenbury Point, his shots possibly missed the target, and his radio messages may have been badly garbled. A student, however, could not help but observe how cramped an aërial navigator is in his small cockpit—probably his chart and pencil blew over the side. He also had the invaluable experience of trying to shoot in a ninety-knot windblast, where it took all his strength to train his machine gun amidships, let alone hitting the target. He, perhaps, wondered, with his head phones in place, shut in a compartment with not an inch to spare, how the regular radio personnel carries on with so much efficiency, hour after hour in the air.

The flights could be favorably compared to the familiarization hops given to prospective aviators upon their arrival at Pensacola. Experience has proved that such flights are of considerable value to a student before beginning dual instruction. Furthermore, those students who intended to become aviators, when their services were available, surely did not have their ardor dampened

for aviation by the summer course at Annapolis. It is a matter of record that two out of every three midshipmen who graduate are not qualified for flying, either through physical disability or through inaptitude. Consequently it is important that every graduate should have as much flight indoctrination as possible.

With the establishment of a permanent air unit there should be, however, more interest on the part of the midshipmen in naval aviation. By interest is meant actual application for flight training after graduation. It seems reasonable to assume that aviation will appeal to a larger percentage of midshipmen if they have real planes to fly instead of obsolete craft that will never again take the air. Midshipmen, too, will be under closer supervision than recently graduated ensigns.

In the past, it has been the sole mission of the Naval Academy flying unit to indoctrinate the students in the fundamentals of aviation. This, undoubtedly, will be the primary mission in the future. However, a secondary mission of no little importance has recently developed and that is to create a keener desire in the midshipmen for flight training. A little reflection concerning the number of applicants for Pensacola clearly shows the need for a change in attitude towards naval aviation.

A recent communication stated:

> No officer can expect to efficiently command in the Navy as it exists today and particularly as indications point that it will be expanded, who is not familiar with the principles of aircraft operation. Regardless of what any officer's ultimate aim may be, it is clearly to his advantage to get this training as soon as he can. For the younger officers, there are no restrictions and Pensacola is open to all a short time after graduation.

But many influences tend to deflect good material from Pensacola. Some of these influences could be minimized. It would be of inestimable value to the naval service if senior officers would encourage competent ensigns to apply for flight training, when their services are available. If the service as a whole appreciated the vital necessity of capable officer personnel becoming naval aviators, the present shortage of aviators would be reduced and aviation efficiency maintained.

The permanent air unit at the Naval Academy will be advantageous not only to the midshipmen but also to the flying squadron whose fleet air work was undoubtedly handicapped by the four months of temporary assignment. Regular gunnery, bombing, torpedo exercises, formations, and tactical problems had to be entirely dispensed with while the squadron was on duty at Annapolis. Proficiency in these exercises demands uninterrupted practice. Consequently the squadron was at a marked disadvantage in competition with similar units of the fleet.

An incidental benefit of the permanent air unit will be the much improved flying facilities for the aviators regularly attached to the Naval Academy and to the Postgraduate School. With a complement of modern planes, these aviators should keep in good flying trim; experience has proved that regular and frequent hops are necessary for aviators to maintain their flying ability.

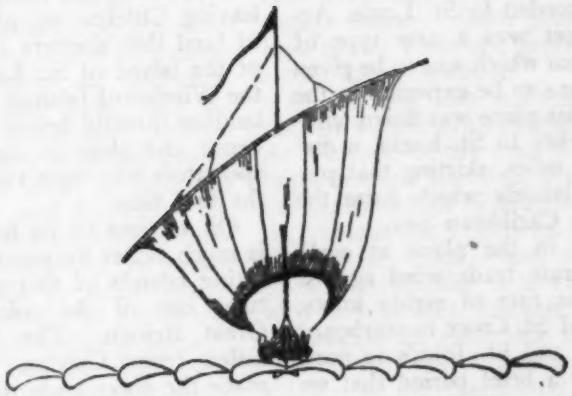
It is not generally understood that the competent and experienced naval aviator flies as he walks, not the least bit conscious of muscular movements required to fly the plane. He flies by instinct—his mind is on his mission. Day after day he practices bombing with all its attendant difficulties in setting sights, in computing wind direction and velocity and in maintaining a steady course and speed. He engages in torpedo practices, skimming over ocean waves like a pelican at three or four feet altitude. The slightest mistouch of the controls might spell disaster. Often his duties require him to observe the gunfire of capital ships and cruisers, with its rigid demands of accurate spotting and faultless communication. In fact, the naval aviator is an integral part of the capital ship's fire control.

Of no less importance is his machine-gun practice in the air for it is only by skillful maneuvering of his plane and accurate gunnery that he can destroy the enemy aircraft. Recognized strategists point out that control of the air in future long-range naval battles may be the deciding factor in the outcome of an engagement.

With the advent of the carriers and patrol planes with a long radius of action, the aviator's navigation must be accurate. It is true that on days of good visibility aërial navigation is quite unlike that of surface ships, for the aviator can see his point of destination miles away. On days of low visibility, however, or in night or fog flying, an aviator must navigate wthin very narrow limits to find his carrier or shore base.

Thus naval aviation demands intelligent personnel—personnel that has had a thorough naval training; personnel that may be required to do tactical scouting, to attack a shore objective, to lay a smoke screen, or to obtain early information of the enemy fleet. If the aviator is not thoroughly indoctrinated in the principles of naval strategy and tactics his information may be of little or no value. There is just one place to obtain that training during peace times and that is the Naval Academy.

It seems logical, therefore, that the desire for flight training should be stimulated at Annapolis, the birthplace of naval aviation. The naval service, of which aviation is an inseparable part, by thus encouraging good officer material to volunteer for flight training, will reap the benefits of a highly efficient aviation personnel.



A Pioneer Flight

St. Lucia, St. Vincent, and Granada by Air

By CAPTAIN W. R. GHERARDI, *U. S. Navy*

THE winter maneuvers of the United States Fleet in 1924 were held in the vicinity of the island of Culebra, which lies between Porto Rico and St. Thomas. As a break in the ceaseless activities of the maneuvers, a period of two weeks was allowed for recreation of the officers and crews, and the ships of the fleet dispersed to various ports.

The aviators of the Aircraft Squadrons, Scouting Fleet, were embarked on the flagship of those squadrons, the U.S.S. *Wright*, leaving all but one of the planes under a guard in the sheltered harbor at Culebra. The ship then proceeded to St. Lucia. Accompanying the fleet was a new type of long-range flying boat which was to be given tests under conditions to be expected in the naval service, and this plane was flown without stop from Culebra to St. Lucia, a distance of about 400 miles, skirting that picturesque chain of islands which form the outer fringe of the Caribbean Sea.

Leaving Culebra in the plane at early dawn with a moderate trade wind against us and flying at the rate of eighty knots, we soon lost sight of St. Croix to starboard and of St. Thomas and St. John's to port, but it was only for a brief period that we were out of sight of land. That little known and curious island of Saba, with its one town in the crater of an extinct volcano, soon hove in sight and from then on there was always one and sometimes several of in Leeward Islands visible.

Flying at an altitude of about a thousand feet and passing close to islands which rise precipitously from the sea to a height of four or five thousand feet, we lost the flattening effect so usual in views from a plane and we were able to see the real beauty of this land and ocean panorama.

In this way we passed close to the eastern side of St. Eustatius, St. Christopher, Nevis, Montserrat, Guadaloupe, Dominica, and Martinique.

The air was a little rough under the lee of these islands where the high land breaks up the steady stream of the trade winds. The sea was smooth close in to the shore but covered with whitecaps in the passages between the islands. Numerous heavy rain squalls over Dominica drifted off to leeward forcing us to steer to the westward to skirt their edges. Through these squalls the deep gorges and high mountains of this wild and beautiful island appeared intermittently.

Five hours and twenty-five minutes after leaving Culebra we glided over the point of land that shelters Port Castries, capital of the island of St. Lucia, which is one of the Windward Islands. We made a perfect landing directly below the governor's residence and close to the excited throng of spectators who were viewing an airplane for the first time.

On account of its fine harbor, St. Lucia is much better known than the other interesting islands of this group, which constitutes one of the colonial possessions of Great Britain. The *Wright*, which had sailed from Culebra a day in advance, made the outer anchorage at the same hour that we landed our plane in the smooth water at the head of the bay. From that time on we were the recipients of the most cordial hospitality on the part of the officials and citizens.

St. Lucia is of volcanic origin and consequently mountainous, the central peak being over 3,000 feet high. Near the southern end of the island is the volcano of Soufriere, bordering on Soufriere Bay, with a crater three acres in extent. Though now quiescent, there are many places in the islands which show latent volcanic activity in the shape of hot sulphur springs. South of Soufriere Bay two conical mountains

known as Gros and Petit Piton rise abruptly to a height of 2,600 feet and for grandeur are unequalled in that part of the West Indies.

Of all the islands of the West Indies none have seen more of historical combat than the rugged island of St. Lucia. For one hundred and fifty years it was the point in the eastern Caribbean most desired by men. Capable of being readily fortified and possessing a land-locked harbor, it lay as a tempting prize to the maritime nations of Europe. The island changed hands from British to French and back again no less than seven times during a century and a half. Now that strategic values have shifted temporarily away from this part of the West Indies, it lies totally disarmed and ungarrisoned, but the names of Rodney, Abercrombie, Sir John Moore, Victor Hugues, De Grasse, and many others are indelibly stamped on the pages of its history.

The nine-hour seaplane trip which followed was unique from two points of view. It was the first and until now the only time that an aircraft of any kind has visited the Windward Islands of St. Lucia, St. Vincent, and Granada. Also the acting governor of the islands, Lieutenant Colonel Davidson-Houston, C.M.G., accepted our invitation to accompany us on this flight, and we thereby witnessed his installation and the taking of the oath of office as acting governor and commander in chief in both the islands of St. Vincent and Granada. In both cases picturesque and impressive ceremonies marked the installation of the governor who came through the air in an American war plane to accomplish the duties and receive the honors of his outlying posts.

Having embarked Governor Davidson-Houston, we taxied outside Port Castries Bay and took off under the lee of Vigie Point. In fifty minutes we were on the water again in the open roadstead of Kingstown, the capital of St. Vincent. Our expected arrival having been cabled ahead, dense masses of natives lined the shores to obtain their first glimpse of an airplane. Astonishment was general. Some were alarmed, others crowded around to touch our clothes. The natives seemed to be uncertain whether we were in truth men of normal type. The official barge took the governor and the officers ashore. The police guard drawn up on the little pier presented arms and a salute of seventeen guns was fired. In military formation we walked to the council hall for the administering of the oath of office to Colonel Davidson-Houston as governor of the island of St. Vincent and as commander in chief of His Britannic Majesty's forces thereon.

A large hall containing a most beautiful mahogany table of horseshoe shape was the scene of the ceremonies. The council of the island sat at the table in order of their rank, the governor in the center. The officials and important citizens occupied one side of the hall and dense masses of the blacks of the island filled all other available space and overflowed into the tropical glare of the streets. The oath was administered, a speech of welcome was addressed to the representatives of the American Navy present, and we adjourned to the Government House for luncheon.

The harbor of Kingstown is not so good as that of Port Castries, being merely an indentation in the coast backed by high hills. When we took off at two o'clock we had to rise from the water against a considerable swell. Like its companion islands, St. Vincent is volcanic in origin and of a wild and savage beauty. Such prosperity as it enjoys comes from the growth of sea island cotton and arrowroot.

St. Vincent has suffered from time to time by violent eruptions of its one volcano. At the time of the total destruction of the important and beautiful city of St. Pierre on the nearby island of Martinique, May, 1902, St. Vincent also suffered a devastating eruption of its volcano and the loss of 2,000 lives. Incidentally, it is a curious fact that with tremendous volcanic disturbances in the islands on each side of St. Lucia, involving the loss of thousands of lives, the volcano on St. Lucia itself remained inactive.

From Kingstown to St. George's, the capital of Granada, is seventy miles as the airplane flies, and at three o'clock in the afternoon we circled around the point and landed on the water of the inner harbor. This was not an easy landing to make because of the strong and irregular currents of air in the harbor. The bay is said to be the crater of an extinct volcano the seaward wall of which has collapsed.

The island was discovered by Columbus, August 15, 1498. He described it to Queen Isabella as resembling a crumpled handkerchief, and there has been no change in this

respect. The town is solidly built in the French style, and like so many islands in the West Indies, Granada has changed hands from French to English and back on several occasions. The ridge which forms the western protection to the harbor is pierced by a tunnel which connects the two portions of the town. Upon our arrival the crowds were on the beach outside the harbor, but as we swung around the point into the inner harbor they rushed through the tunnel, looking in their white clothes like a stream of water issuing from a gigantic hose.

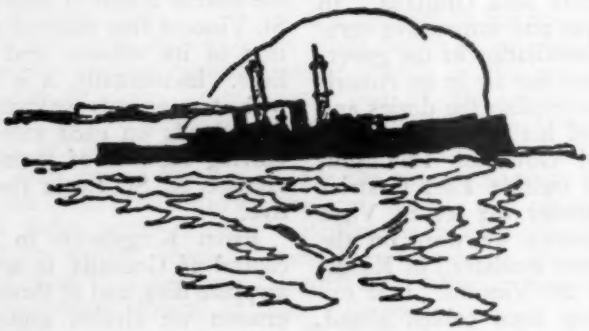
On account of the security of its harbor Granada in the bad old days was a pirate stronghold. Often the buccaneers and the local officials shared in the prosperity brought about by piracy. It is said that the scene of Sabatini's novel, *Captain Blood*, is laid in Granada. A fine old stone fort still dominates the town.

The ceremonies at Kingstown, St. Vincent, were repeated at St. George's, Granada, and the official party was taken for a short drive about the island before departing. At five o'clock we taxied outside the harbor, preferring to take off in the light swell rather than in the treacherous wind currents under the land. We left our hospitable hosts with regret but the time was limited and we were due in St. Lucia by nightfall.

Passing over a charming archipelago of islands, the Grenadines, we dipped down into Port Castries harbor at just seven o'clock, after a total absence of nine hours. These hours could hardly have been more interestingly employed, and traveling in this manner recalls to mind the description of the flight of the magic carpet in the *Arabian Nights*:

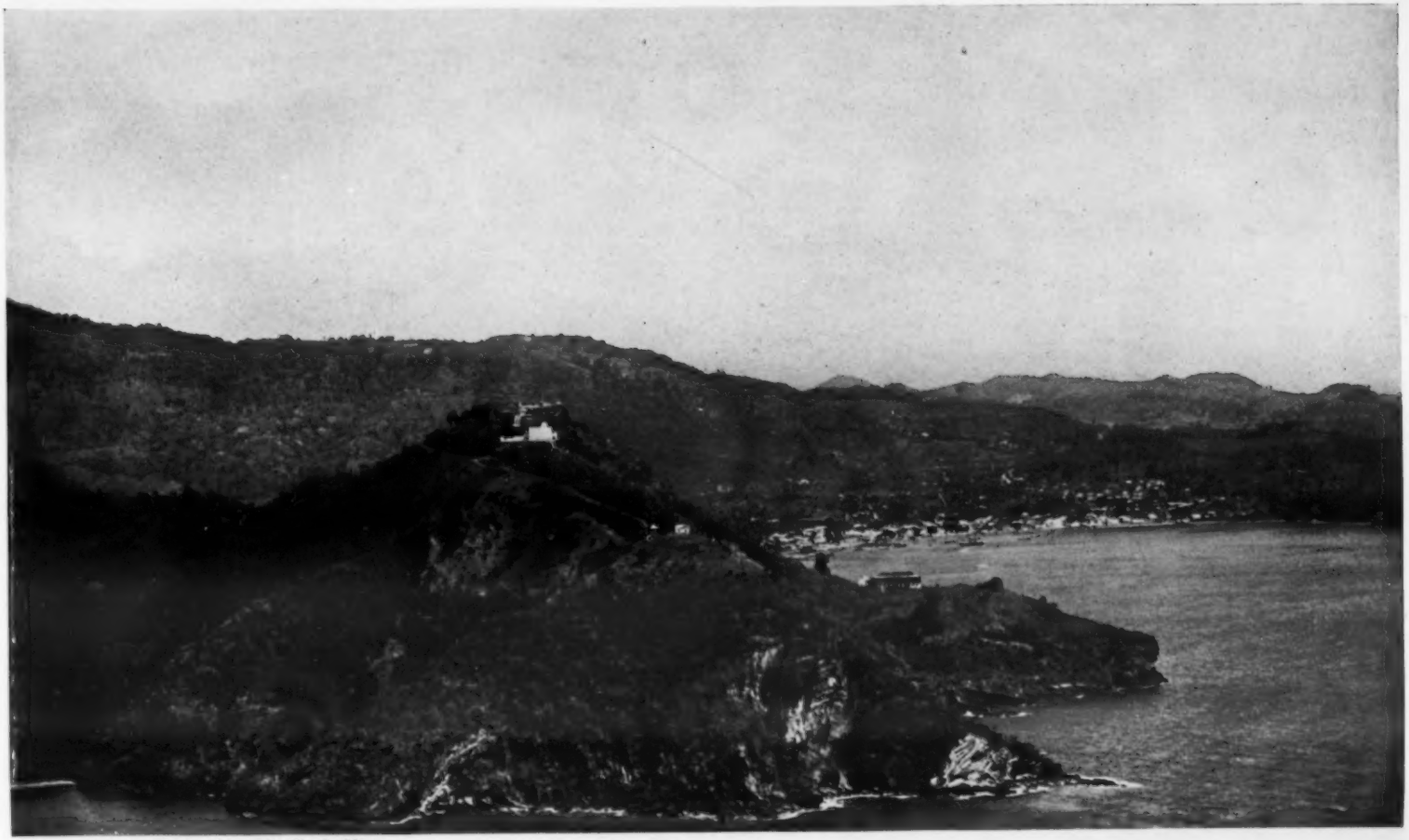
> 'Tis true, O my Lord, its properties are singular and marvelous. Whoever sitteth on this carpet and willeth in thought to be taken up and set down upon other site will, in the twinkling of an eye, be borne thither, be that place nearhand or distant many a day's journey and difficult to reach.

Had this trip been made by commercial transportation as regular steamers were scheduled at this particular time, it would have taken about three weeks.



Courtesy Captain W. R. Gherardi, U. S. Navy

PLANES OF SCOUTING FLEET AT CALDERA BAY, D. R.

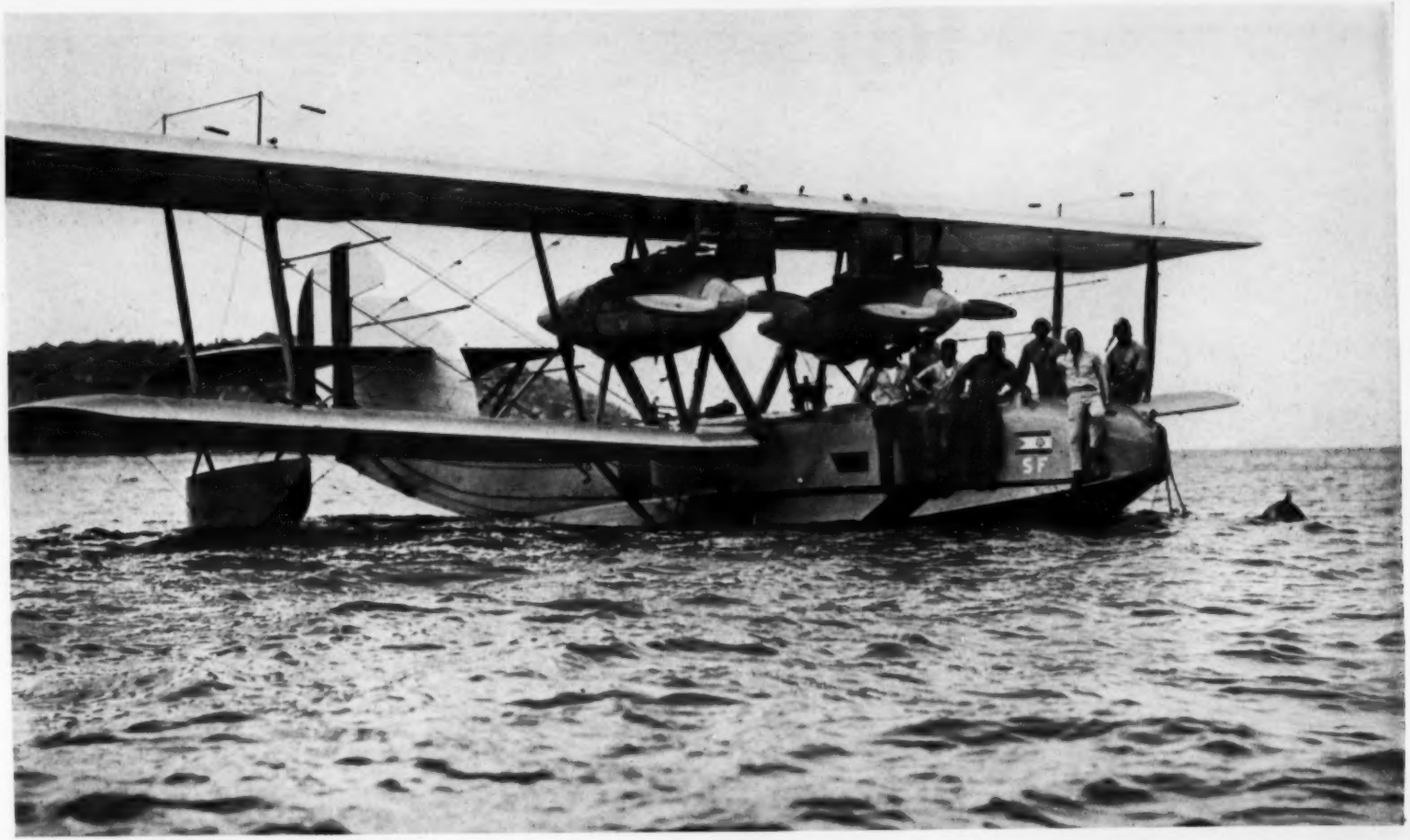


Courtesy Captain W. R. Gherardi, U. S. Navy

KINGSTOWN, ST. VINCENT

Courtesy Captain W. R. Gherardi, U. S. Navy

GOVERNMENT HOUSE AT PORT CASTRIES, ST. LUCIA

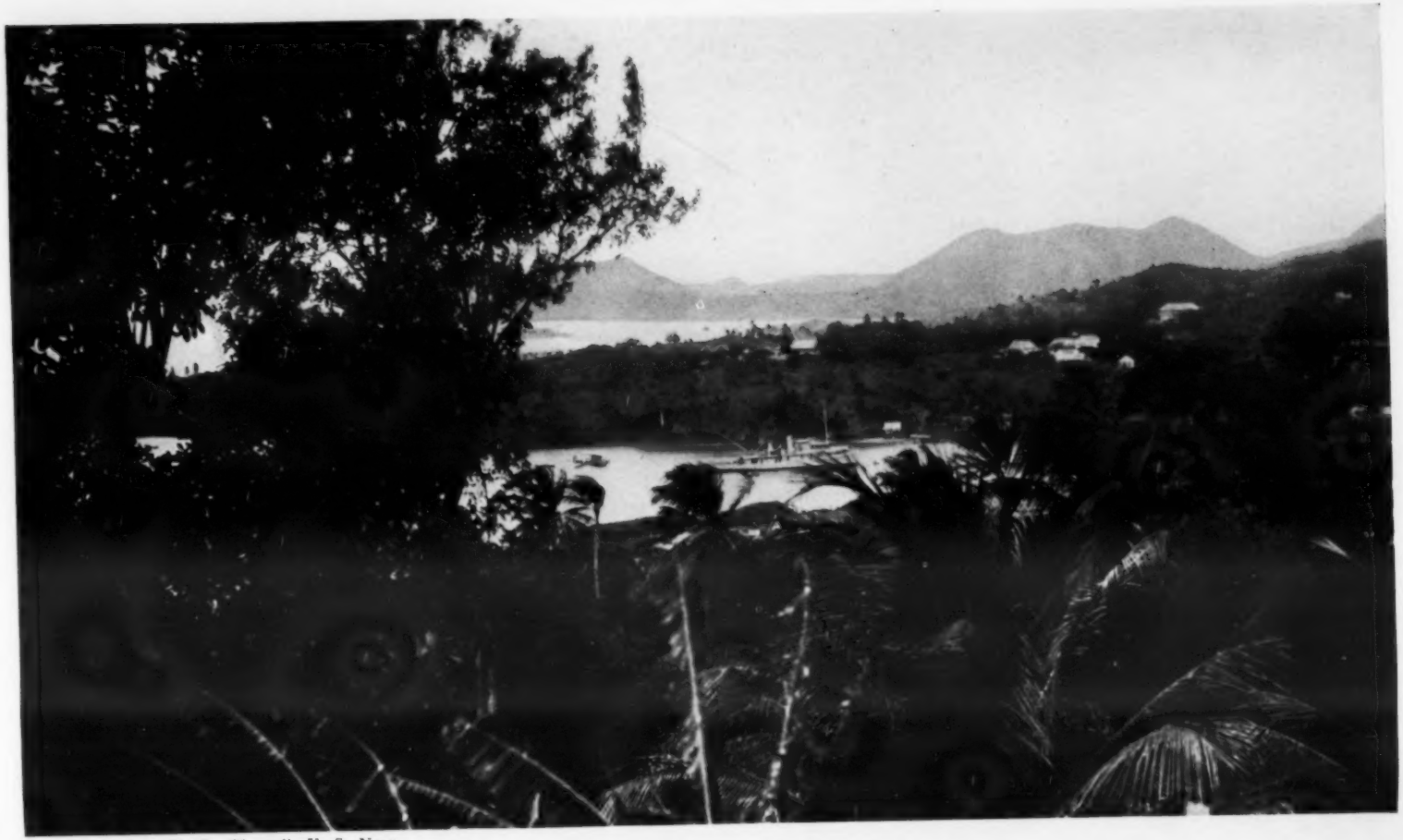


Courtesy Captain W. R. Gherardi, U. S. Navy

PN-7, FLYING BOAT

Courtesy Captain W. R. Gherardi, U. S. Navy

PORT CASTRIES, ST. LUCIA



Courtesy Captain W. R. Gherardi, U. S. Navy

U. S. S. *TEAL* AND *PN-7* AT PORT CASTRIES, ST. LUCIA

U. S. S. *TEAL* AND *PN-7* AT PORT CASTRIES, ST. LUCIA

Courtesy Captain W. R. Gherardi, U. S. Navy

ST. THOMAS, VIRGIN ISLANDS

Courtesy Captain W. R. Gherardi, U. S. Navy

CHRISTIANSTED, ST. CROIX

Courtesy Keystone Aircraft Corporation

KEYSTONE-LOENING "AIR YACHT"

Courtesy Keystone Aircraft Corporation

THE "AIR YACHT"—ON THE WATER, WITH LANDING WHEELS RETRACTED

Courtesy Keystone Aircraft Corporation

THE "AIR YACHT"—ON THE WATER, WITH LANDING WHEELS RETRACTED

Courtesy Keystone Aircraft Corporation

THE "AIR YACHT" IN THE AIR

Courtesy Hall-Aluminum Aircraft Corporation

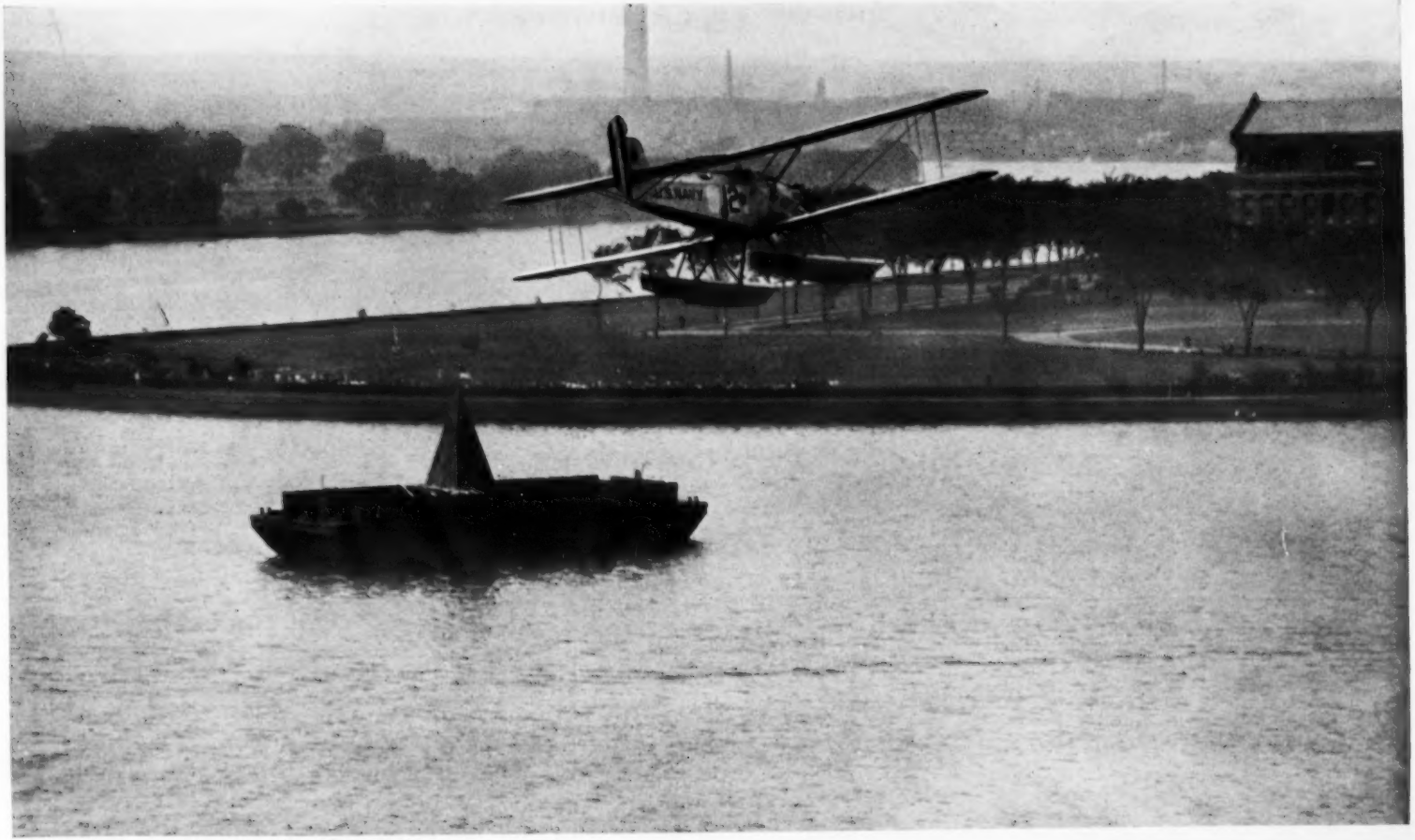
THE *XFH-1* NAVY PURSUIT PLANE

With all metal body, designed to give flotation in case plane is forced to land on water.

With all metal body, designed to give flotation in case plane is forced to land on water.

Courtesy Bureau of Aëronautics, Navy Department

THE BEACH AT NAVAL AIR STATION, ANACOSTIA, D.C., MAY 29, 1929
The day of the seaplane races



Courtesy Bureau of Aëronautics, Navy Department

SEAPLANE TURNING A PYLON AT THE SEAPLANE RACES, NAVAL AIR STATION, ANACOSTIA, D.C.

SEAPLANE TURNING A PYLON AT THE SEAPLANE RACES, NAVAL AIR STATION, ANACOSTIA, D.C.

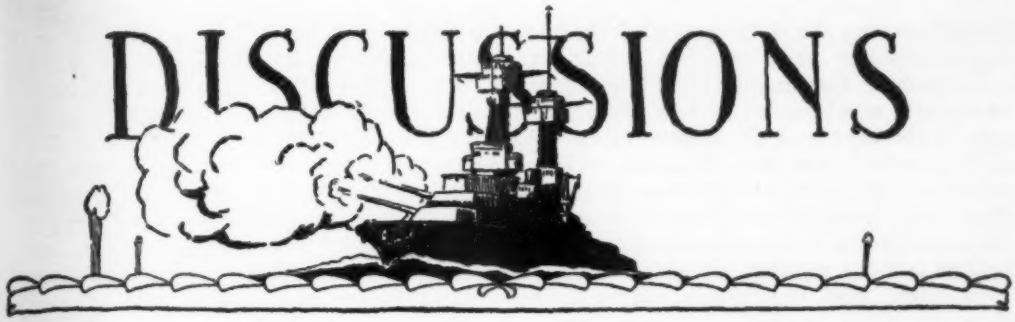
Courtesy Bureau of Aëronautics, Navy Department

SHOWING EQUIPMENT WORN BY LIEUTENANT A. SOUCEK, U. S. NAVY
When he recently broke the world's altitude record for all types of planes

Courtesy Bureau of Aeronautics, Navy Department

LIEUTENANT A. SOUCEK, U. S. NAVY
Walking from his plane after breaking world's altitude record for seaplanes

DISCUSSIONS



LIEUTENANT A. SOUCEK, U. S. NAVY
Walking from his plane after breaking world's altitude record for seaplanes

Training Reservists Aboard Destroyers

(See page 502, June, 1929, PROCEEDINGS.)

LIEUTENANT COMMANDER W. H. MCEWEN, U. S. NAVAL RESERVE.—The long-anticipated article containing the viewpoint of an officer of the regular establishment who has actually made contact with the Naval Reserve on its annual fifteen-day tour of duty afloat has appeared in the June issue of the PROCEEDINGS. The writer for some time has hoped that a destroyer officer would put in print, for the edification of the Navy and Naval Reserve, his ideas of this program of training, together with his observations of the reserve personnel afloat, its necessary shortcomings, and some constructive criticisms and suggestions, to enable commanding officers of destroyer reserve units to further the good cause of making the reserve personnel more efficient each year.

I am sure that reservists everywhere, whether or not they are destroyer units, will read with marked interest the comments in the excellent article by Lieutenant Commander Richard Stockton Field, U. S. Navy, who evidences having made some close observations of those reservists who cruised on board his ship, the U. S. S. *Bainbridge*.

The body of officers and men comprising the Naval Reserve, plus the men transferred from the regular Navy into various classifications of the Fleet Reserve, are all that the Navy has as a reserve in the event of a national emergency. Since the passage by Congress of the present Naval Reserve Act, which brought about a complete reorganization of the reserve forces, it is my observation that progress is being made by the Navy Department in arriving at its objective in the creation of a reserve force as a second line of defense to the regular Navy.

That the Navy Department does not do more for the reserve is recognized by all familiar with the situation in Congress, as due to the pressure of the so-called wave of economy that has prevailed for the past eight years, together with the strong pressure of the professional group of pacifists, which has exerted every influence by its strongly organized lobby in Washington to defeat every measure for national defense. The Navy knows all about this, particularly those who have had charge of the annual appropriation bills. May I remark in passing, that never before in peace times has the organized power of the Naval Reserve been brought into more intensive play to combat the pacifist opposition.

Having the viewpoint of the officers of the regular Navy on the training of reservists, it is my intention in this paper to express the viewpoint of the reserves, as I see it, on the same subject; and by the exchange of opinions, develop something tangible that will prove beneficial to the service as a whole. In this effort I am not unmindful of the great good accomplished each year at the annual meeting of the Naval Reserve Officers' Association in Washington, together with the annual conferences held in Washington between the commandants of the several naval districts with the heads of the Naval Reserve Division of the Bureau of Navigation. These conferences have accomplished much good and should be encouraged to the point where frank discussion of the phases of Naval Reserve training may be the order of the day.

In this connection, it is my firm belief that the annual tour by the inspectors attached to the Naval Reserve Division of the Bureau of Navigation is proving highly beneficial to all concerned. These officers actually witness the conditions under which the reserves

operate during the fifty weeks of the year they are not on board ship for instruction.

Lieutenant Commander Field has given us a frank word picture of how officers and men of the destroyer force have taken hold of their part in the plan of training. What was done on the *Bainbridge* was practically duplicated on other ships in connection with the assimilation of the conglomerate reserve ratings into the regular ship's company. The men soon found themselves, within a few days got their bearing, and each day displayed more efficiency and interest in their duties.

The playing of the Naval Reserve game begins with a hobby, or better, love of service or for The Service. How was this "love of service" achieved, that developed this hobby for the Navy which means so much personal sacrifice of time and money and the foregoing of the many civilian social activities and annual vacation periods? It came only through the contacts made before and during the World War by both officers and men, during which they became imbued with the spirit of the service and indoctrinated with its high ideals of duty and devotion to a patriotic cause. This incomparably high code of honor, plus the inspiration of the naval-military phase of naval life and atmosphere "got under the skin" and stayed there with all of us (except for a few grouches), who have lived the life and played the game.

It is this type of reservist who today is carrying on for the Navy. Lieutenant Commander Field's statement that we soon must have new blood in the commissioned personnel of the reserve is quite true but until such time as we can procure this officer material or until such time as the Naval R.O.T.C. produces this personnel, you will probably find the so-called old-timers still playing the game and foregoing their annual two weeks' vacation with their families. Why? The answer is obvious!

Lieutenant Commander Field mentions in his article the value and attitude toward the reserve of the Naval Academy graduate who has resigned to enter civil life. In some instances his statement is regrettably true. On the other hand, I believe it is not in many cases the ex-Naval Academy graduate's fault. I know of many instances where graduates have resigned from the service and entered civilian life and located in some city where they later discover there is stationed a unit of the reserve. If they remain in this particular city for any length of time the "bug" of the service gets them and they appear at the armory. They want to "join up"—want to get back in the game. But in so many instances they have not the slightest knowledge of what it is all about; why they cannot get their rank, etc. Why does such a condition exist? Some one has assumed that all officers in the Navy know all about the organization and regulations governing the reserve. Such is not a fact, however, if reports made to the reserve unit commanders by these graduates are true. It is my opinion that the Bureau of Navigation, upon receiving the resignation of a young officer, should mail him a pamphlet containing a résumé of the Naval Reserve and inform him by letter the name of the commanding officer of the reserve unit near his home. It is to be regretted that so many Academy men are not affiliated with the reserve, where their valuable training and experience could be such a big asset.

To be sure, the Academy graduate would have to forget many of the shortcomings of the volunteer outfit. He would have to learn that all hands would not jump at the snap of his fingers. He would have to get the civilian viewpoint—he will need it in his civilian endeavors—and no better place is offered than right with the Naval Reserve officers who, in most instances, have some business and social standing in their respective communities and could give this newcomer many valuable hints on what to do and how to do it.

I wonder how many officers have given this thought any consideration. I hope this suggestion may have some consideration because I have seen so many cases where continuity of service is lost together with the loss of rank, and everyone knows the grief of accepting a rank lower than held in the regular Navy. Some ex-officers have to their credit taken this loss in grade and played the game. But at best it is most discouraging and does not make for a high *esprit de corps*. If this suggestion is carried out, it is thought that the ex-Naval Academy graduate will request an immediate appointment in the reserve and carry on in the work in which he was educated, and thereby help solve the commissioned officer problem in the reserve. As the years roll by this problem is becoming a serious one not only to

the Department but to the leaders in the Naval Reserve movement throughout the country.

The family circle at the wardroom table develops much general discussion during and after meals; it is around this festive board that many of the ills of the world are settled for all time. These chats are always interesting, particularly to the reservist, when topics of every nature have their swing and opinions are exchanged. It is at these gatherings that the spirit of shipmate and messmate is developed which further binds the ties of mutual understanding.

It is rare indeed that the discussion does not lead up to the doings of the industrial world. Here the reservist can hold forth on the civilian activities in his home city, and we find the naval officers deeply interested in what is going on everywhere. They ask many questions, all with the view of broadening their general knowledge.

I have been asked so many times, particularly by the youngsters, why I make the sacrifice of my time and money (it does cost real money), to play this Navy game. My answer, and I venture to hazard a guess this statement is applicable to the majority of the reserve officers, is that I must have a hobby and play it hard in order to carry on in my civilian pursuits. When I explain to these officers that I have not enjoyed my vacation with my family for more than twenty years, they gaze at me in utter amazement. They do not understand our instincts for this naval life; they have not had the opportunity to be both civilian and naval officer; they have not had that experience nor felt the pulse that actuates the busy civilian life with all its diversified ways of making a livelihood. It is not their fault. They entered the Academy at school age and devoted their energy to perfecting themselves in one line —the profession they have chosen for a life's work. This demands an exacting performance of study, drill, and general reading that they may keep up to date. Like the civilian messmate for fifteen days each year, they are also in a highly competitive field—with the selection board weighing their performances.

Therefore, to my mind this annual cruise for the reservists on ships of the fleet is twofold in its results. It works to the advantage of both branches in many respects. The reservists get their training under actual conditions and make contacts which are bound to prove not only professionally advantageous but also place them in closer touch with service conditions and its *esprit de corps*. When they return to their homes they carry with them these impressions and enter upon their winter months' work in the armory with renewed energy and interest in their problems.

I have digressed slightly from my vain subject, training afloat—but I wanted to give expression to a few thoughts, that the younger officers of the regular Navy might get the proper viewpoint.

Returning to the subject, it is with unstinted praise that I commend the Department and the commanders of the fleets for the diversified program which is prepared for the fifteen-day training period. Each year we find this daily program of instruction more interesting and educational. Night cruising has been reduced, and I believe this time has been better applied to schools of instruction, to general ship drills, and to small-boat work, to the advantage of all concerned.

The maneuvers are always interesting and just enough cruising is performed not to tire out all hands by long watch-standing. This gives an opportunity for reserve officers, if qualified, to stand a watch under supervision, and for the signalmen and lookouts to prove their worth.

One of the biggest and best things the Department has done for building up the morale of the reserve is to allow them to hold target practice. This has done more than can be imagined to help create a greater *esprit de corps* within the destroyer units. It has injected the same good-natured rivalry in the reserve that is part of the life on board a man-of-war. This practice should be a part of every cruise. It is great for these landlubbers actually to feel the gun in action and, besides, it gives the men something to talk about during the long winter months in their armories.

Target practice should be continued every year and every destroyer unit should be permitted to fire whether it has done so previously or not. It is no hard task to train two guns' crews to a point where they may fire this practice in safety in ten days of drill, with safety precautions emphasized at the end of each drill period. That green men may be trained in so short a period was

proved during the war and some excellent pointers, trainers, sightsetters, and loading crews were developed. Even in the last two years on the destroyers the work of the guns' crews that fired was highly commendable.

I believe it would be quite worth while to devote some time daily, if conditions permit, to instruction of officers in spotting practice. On the ships that I have served, the senior officer of the reserve is generally given the opportunity to conduct the ship control end of the practice. This should be encouraged in order to create confidence and educate him in this responsibility, while other officers handle the bearings on the approach to the range, etc.

I quite agree with Lieutenant Commander Field that it would be a fine experiment at least to have the Department assign these destroyer units to the same ship for a few years. I believe it would develop increased ship spirit. It would be "our ship" and would remove the annual guess work as to what ship will we cruise on this summer, is she a happy and efficient ship, and how does she stand in the squadron?

In addition to the list of officers and men of the respective divisions which are mailed to the commanding officer of each vessel in advance, I always set up against each name, by a key system, a brief résumé of his previous experience. I find this is a help to the executive officer in arranging his watch, quarter, and station bill.

I believe that tours of inspection of the Torpedo School and the station at Newport, Rhode Island, should be part of the training afloat, and that the officers should visit the War College. This is always interesting and gives them something additional to discuss.

I am firmly convinced that it would be a fine thing for these destroyer units to visit one of the battleships. I believe arrangements should be made to accomplish this most valuable tour of inspection and that the ship visited should furnish the necessary details of petty officers, to give brief lectures on the use of the various installations. But to my mind the most beneficial phase of this visit would be that the reservists could get a glimpse of the battleship life, its orderliness, cleanliness, and the military spirit and discipline that pervades. It would be time well spent and I trust that in the near future this suggestion may be considered.

Commander Field touches upon the ports for liberty. He is absolutely correct in this viewpoint. Make these ports as far away from the unit's own home port as possible. Let the men get a glimpse of other cities and have the itinerary changed yearly. One big feature that would surely hold up the men's interest would be for the squadron to visit a foreign port for the week-end liberty. Go to Bermuda, Havana, Halifax, or even to the Azores.

In closing, there is one point that we always hear being discussed on the destroyers: How will this reserve cruising affect the standing of these ships? We are most appreciative of the competition in all departments of the destroyer force, and I have sometimes wondered whether or not these cruises affected the standing in ship or engineering performance. If they do, I believe an allowance should be made by the Department for ships on this important duty; the standing of the ships should not be jeopardized for this work. Let us hope that this is being done so that we will not leave the ship with the proverbial Form H ever ringing in our ears. We do not want to be "good riddance of bad rubbish"—we want to come again next year and feel that we are welcome despite our many shortcomings.

Uses of Aircraft in Naval Warfare

(See page 121, February, 1929, Proceedings)

Lieutenant Commander G. R. Fairlamb, Jr., U. S. Navy—Lieutenant Commander Gladden's article is disappointing not only in method of treatment but also because he failed to keep to his subject. In fact, he does not really tackle his subject at all until the seventh page, when he begins to confine himself to *naval* usage of aircraft under the heading "The Principle of Surprise."

Under the heading "The Principle of Objective," he lists the functions of naval aircraft, although just what relation the selection of an objective has to do with tactical employment is not made clear. It is the business of strategy to select objectives, and a discussion as to whether *naval* aircraft should or should not be employed (a) to operate against the enemy fleet air force, (b) to operate against the enemy main body, (c) to operate against his line of communications, etc., would seem in order un-

der this heading. The author side-steps this with trite truisms.

Under "The Principle of the Offensive," he reverses himself. "When the strategic plan undertaken requires general and lasting control of the air, the enemy's sources and means of production should be bombed and destroyed as well." Previously he stated that "the primary objective should not be the vital centers behind the enemy's lines or frontiers." Can any future war be visualized without the strategic plan for so-called "control of the air" in all theaters of operation, with consequent bombing behind the lines? But this is *land* and not naval warfare.

As a matter of fact, there will be no such thing as "control of the air" comparable to what we understand as "control of the sea." The term is entirely misleading and "air superiority" should be substituted for it.

Aside from permitting himself to talk about air warfare over land and thus wander from his purpose, the author makes some astounding statements, some of which are: "Their [aircraft] usefulness depends upon flight and that can never become completely reliable." Why not? Why may we not expect the aircraft engine to develop the same dependability as an automobile engine? Are they *less* dependable today than the submarine's Diesels? Again: "A nation whose principle arm is aircraft, can only fight in favorable regions and at opportune times." Possibly, but aircraft can and do operate under very unfavorable conditions; in the Arctic for example. How about weather limitations upon armies and navies? Do not they too suffer under limitations of weather? Again: "Therefore they [aircraft] must have the assistance of the navy in their operations." This is the wrong attitude and viewpoint. Naval aircraft *are* the Navy, just as much as destroyers, cruisers, battleships are. Do not the battleship squadrons require the "assistance" of the destroyer, cruiser, and submarine squadrons, and *vice versa?* Again: "A study of the possible uses for aircraft clearly shows that the major rôle of aviation in war is one of assistance, ..." Quite true. Guns are also of assistance. But the author implies here as elsewhere, that naval aircraft may be used only as an adjunct. As a matter of fact, naval aircraft are a *force* that can and will be employed to strike an enemy fleet long before the main bodies get into gun range. This is assistance in its highest form. Aircraft need not and will not be confined entirely to the fetch and carry type of assistance.

Where the author touches on material, he indicates want of knowledge on latest developments. The bomber's target need *not* be on a constant course and speed any longer for satisfactory bombing results, contrary to the statement made. Improved bomb sights have been developed obviating this former essential for *direct* hits. Also, an improved bombing method has been developed and a new type plane to utilize the method to its limit is coming out.

While it is true that aircraft communications are difficult and the problem is a hard nut to crack, I cannot agree that it will never be solved, nor do I think that "anything but Very pistol stars is beyond consideration" for interplane communication. As a matter of fact, the author after stating the delinquencies of aircraft communication, points out that ship-board communication fell down at Jutland in the British fleet.

The author touches on scouting under "The Principle of Surprise," and states that to deny information to air scouts it will be necessary to have an air patrol both *above* and *below* the cloud ceiling from before dawn until after dark. I submit that this will be, first, impracticable for want of planes, limitations of weather, etc., and secondly, ineffective. Likewise, I cannot agree that a fleet must keep a *continuous* patrol of fighting planes aloft during daylight hours when bombing attacks are possible. It is likely to be wasted effort, and the attack may develop when the patrol is in need of service. Flying hours will have to be conserved. It is not in keeping with economy of force. The fleet cruising formation must be arranged to give timely warning instead. Nor is it clear how many fighter aircraft should be carried on the basis of two to every enemy bomber. In the first place, will we know how many enemy bombing planes there will be? Suppose the enemy had only bombers and in such magnitude of numbers that if we matched two to one, all carrier and ship-board space would be taken up with fighters. Should we then dispense with our own bomber and observation types? On the contrary, far from load-

ing up with fighters, we should carry the maximum of *"offensive"* planes. We should worry less about combatting in the air, and concentrate on loosing our air strength against the enemy battleships and carriers. This is in accord with the principle of "selecting the objective" for our aircraft and the principle of the "offensive." In a fleet battle the *sideshow is the air combat.* The real objective is the enemy ships. In other naval operations the enemy air force in the air may be the first objective, but whenever it is possible to get it on the airdrome (whether ship or land base) it may be tritely observed that there will be no need to get it in the air.

Lieutenant Commander Gladden stated truly that discussion on all possible and profitable avenues of the subject would fill volumes. There are probably as many ideas on the subject as there are naval aviators. I submit that the subject is a highly controversial one and will remain so until we have more carriers, and have actually worked out the kinks in fleet maneuvers. Of one thing, however, I am sure. It is faulty to approach the subject with the idea that our air squadrons are only handmaidens to the fleet. Lieutenant Commander B. G. Leighton (resigned) has ably pointed out that airplanes are also guns—weapons. They are even more than that when properly organized and employed. They are a "Force" —just as much so as the Cruiser Force, Destroyer Force, or any other tactical subdivision of the Navy.

The Speed of Battleships

(See page 273, April, 1929, PROCEEDINGS.)

LIEUTENANT COMMANDER FRANK LUCKEL, U. S. Navy.—Lieutenant Percival's admirable article presents the arguments for protection in a very able manner. Truly, as stated in the reference to the Damage Control Organization in the German Navy, there is no more important duty than that of keeping the ship afloat. However, has not Lieutenant Percival failed to take into account the necessity of providing for action against an enemy having battle cruisers? With our capital ships limited to seventeen-knot battleships, there would appear to be no protection against raids by commerce-destroying battle cruisers. As long as other navies have capital ships of high speed there would appear to be need for similar vessels to combat these and which would also be available to operate as a fast wing in conjunction with our battle line. Of course, this does not invalidate the argument for a lower battleship speed, provided the necessity for battle cruisers in addition to these be realized. Lieutenant Percival stresses the use of speed in running away but does not mentions its offensive value. If one battle line has sufficient excess speed to partially cap or envelope the head of the other, it might, by concentration, demonstrate the principle that the best protection is afforded by superiority of gunfire, even though the slower vessels might have better individual protection. Would not the slower battleships also be subject to a greater torpedo menace due to enemy torpedo craft being able to reach a more advantageous firing position as well as to the slower ships being handicapped by their low speed should they have to maneuver to avoid being struck? While Lieutenant Percival admits the potential strategic value of speed, he assumes that seventeen knots will be sufficient for a fleet strategic speed. It is doubtful whether this would be the case were a portion of the fleet operating temporarily without being encumbered by slower vessels. Without detracting from the general soundness of Lieutenant Percival's conclusions, might we not attempt to achieve some additional protection by improved construction methods, such as the welded hull ascribed to the new German cruiser?

PROFESSIONAL NOTES

30 MAY TO 1 JULY

LIEUTENANT COMMANDER D. B. BEARY, U. S. NAVY
LIEUTENANT COMMANDER D. C. RAMSEY, U. S. NAVY
AND
PROFESSOR HENRY BLUESTONE, U. S. NAVAL ACADEMY

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UNITED STATES

Bids for 5 New Cruisers

The New York *Times*, June 16.—Washington, June 15.—In the absence of any international agreement for limitation of naval armament, the Navy Department, acting under authorization of Congress, took today the first step in the program for the building of fifteen 10,000-ton cruisers, Secretary Adams opening bids and estimates for the first five. President Hoover has authority to discontinue the building program whenever a naval limitation agreement is reached, and should such a compact result from the forthcoming conference between the President and Premier MacDonald of Great Britain, work on the vessels could be halted pending a parley.

The bids from private builders and estimates from navy yards opened today ranged from $8,838,000 to $11,996,364. The New York Navy Yard submitted an estimate of $10,508,100 for one cruiser to be built within thirty-six months and of $9,639,403 for a second to be built within forty-two months. With guns and other equipment it is estimated that the cost of the ships will run around $17,000,000 each.

All the bids and estimates were referred by Secretary Adams to departmental bureaus for analysis and report. He hopes to award contracts by July 1, the beginning of the fiscal year 1930. Congress specified that five of the cruisers are to be laid down each year for the next three years, with the airplane carrier to be contracted for at any time within the three-year period. It is expected that bids and estimates will be called for on the next group of five early in the next fiscal year if there is no change in the armament limitation situation.

Congress specified that three of the first five cruisers should be built by navy yards and the other two by private yards.

The bids and estimates opened today were as follows:

Newport News Shipbuilding and Dry Dock Company—One vessel to be constructed at Newport News, Virginia, and delivered at the Norfolk Navy Yard within thirty-six months from the date of contract, $11,130,000. If payments made prior to July 1, 1930, are limited to $1,000,000, the vessel will be constructed within thirty-nine months.

Bethlehem Shipbuilding Corporation, New York—One vessel to be constructed at Quincy, Massachusetts, and delivered at the Boston Navy Yard within thirty-six months from the date of contract, $10,753,000. If payments made prior to July 1, 1930, are limited to $1,000,000, the vessel will be constructed within the same period and for the same amount.

New York Shipbuilding Company, Camden, New Jersey—One vessel to be constructed at Camden, New Jersey, and delivered at the Philadelphia Navy Yard within thirty-six months from the date of contract, $10,903,200. If payments made prior to July 1, 1930, are limited to $1,000,000 the vessel will be constructed within the same period and for the same amount.

Boston Navy Yard—One ship for $11,895,931, with a construction period of forty-five months if the vessel is built in dry dock and the main engines purchased, and $11,948,864 with the same construction period if the vessel is built on the shipways and the main engines purchased. If engines are built in navy yard, $11,943,431, with a construction period of forty-five months if vessel is built in dry dock, and $11,996,364 with the same construction period if built on shipways.

New York Navy Yard—One ship for $10,508,100 within thirty-six months and a second ship for $9,639,403 within forty-two months.

Philadelphia Navy Yard—One ship for $10,285,906 within forty-two months and if an order is placed for two ships, $10,000,000 each in a construction period of forty-two and forty-eight months, respectively, after the shipways are ready.

Mare Island Navy Yard—One ship for $9,307,770, with a construction period of forty-five months.

Puget Sound Navy Yard—One ship for $8,838,000, with a construction period of forty months.

Details of the designs for the new ships were not revealed, being held in confidence as military information which should not be communicated to foreign powers. It is understood, however, that the designs follow fairly closely those of the eight 10,000-ton cruisers now nearing completion.

The vessels will carry nine 8-inch guns, torpedoes and seaplanes and be capable of a speed in excess of 33 knots. Their armor-plating will be light to permit as great a speed as possible consistent with necessary protection for vessels of their class. When the new vessels are placed in commission old cruisers will be put out of commission, so that the navy considers the new ships as essentially replacements.

With the completion of the eight now under construction and the fifteen to be laid down in the next three years the United States would have thirty-three modern cruisers of 10,000 tons each and ten of 6,600 tons each built since the Washington armament conference. With all the old cruisers out of commission this would make a total of 296,000 tons of modern cruisers, with no second-line ships of that class. The maximum limit for cruisers suggested by the United States at the futile naval conference at Geneva in 1927 was 300,000 tons.

Chester to be Launched July 2

Army and Navy Journal, June 15.—The light cruiser *Chester* will go down the ways at Camden, New Jersey, July 2, marking the launching of the first of the nine-gun type of cruiser of the light cruisers now under construction. The two already launched, the *Salt Lake City* and the *Pensacola,* are of the ten-gun type. All of the remaining five cruisers in this program will be of the nine-gun type.

The ten-gun ships have two turrets forward, one of three and one of two guns, and the same arrangement aft. The nine-gun type has only three turrets, two of three guns each forward and one of three guns aft. The advantages pointed out for the latter type include better distribution of weight and the less number of personnel needed on the three turret ships than on the four turret ships.

The *Salt Lake City* is the first one scheduled for completion, the date set now being October 9, 1929. The *Pensacola* will be next on February 1, 1930, while the *Chester* and the *Northampton* and the *Houston* are scheduled for completion, June 13, 1930. The three others, the *Louisville,* the *Chicago* and the *Augusta* are due to be completed March 13, 1931.

Submarine Rescue Vessels Assigned

Washington *Post,* June 16.—The Navy has converted five ships into submarine rescue vessels and has ordered them to various vantage points from which they can be dispatched without delay in case of emergency.

The ships are the *Mallard,* to Coco Solo; the *Falcon,* with the control force; the *Ortolan,* with the battle fleet; the *Widgeon* to Pearl Harbor, Hawaii, and the *Pigeon* to the Asiatic Station.

The *Chewink,* at New London, is also to be partially fitted out as a submarine rescue vessel. To further facilitate work in rescuing the crews of stricken submarines the department has placed ten pontoons for raising the submarines at each of these points.

In rescue work the element of time is all important, it was pointed out. The speed in assembling of vessels and equipment together with their rapid and efficient use in the operations of giving assistance to damaged submarines, can only be accomplished through careful maintenance and frequent practice or drill.

In order that there will be no delay in carrying out these operations when needed the Navy Department has directed that the "operating schedules provide for adequate and frequent training to include test of divers, test of listening gear in locating a submerged submarine, test of supply of air to submarine compartments and air bottles by rescue vessels, test of blowing submarine tanks by the rescue vessel, test of efficiency of pontooning, and inspection and inventory of equipment, both ashore and afloat."

GREAT BRITAIN

Naval Disarmanent and New Ships

The Engineer, June 14.—According to Washington messages, the new American ambassador, General Dawes, has brought with him to London certain proposals for naval reduction which are somewhat drastic in character. They are said to involve, on the one hand, the suspension of the American cruiser program, and, on the other, the cancelling of certain British ships already begun, if not actually completed. In view of these reports, it seems opportune to note the present state of British naval construction. The 10,000-ton cruiser *Shropshire,*

launched last July, although well advanced, will not be completed for several months. The *Norfolk* and *Dorsetshire* of the same type, put afloat during the winter, are not to be delivered until next year. The 8,400-ton cruiser *York*, launched in July, 1928, is being fitted out, and her sister *Exeter*, is to take the water next month. Two cruisers of the same medium class, provided for under the 1928 Estimates, are in the earliest stage of construction at Portsmouth and Devonport respectively. Finally, the estimates for the current year provide for three cruisers—two of a new light class, armed with 6-inch guns, and the third of a type not yet decided upon. These three ships would not, in any case, be ordered until the financial year was well advanced. Thus the present position is that we have ten cruisers being completed, being built, and projected, these being vessels of the type most likely to be affected by any new scheme of naval retrenchment. Of smaller craft we have in hand or projected twenty-seven flotilla leaders and destroyers and eighteen submarines, the majority of which are being or will be constructed in private shipyards. It is scarcely necessary to say that the progress of any future negotiations on naval disarmament will be followed with keen interest by the British shipbuilding and allied industries, which have already been gravely affected by the general policy of naval limitation pursued in recent years.

Launchings

Destroyers

London *Times*, June 17.—Launching dates have been approved for two more of the destroyers of the 1927 program laid down in private yards during 1928. The *Antelope* will be put afloat by Hawthorn, Leslie and Co., Limited, Newcastle-on-Tyne, on July 26; and the *Acasta* by John Brown and Co., Limited, Clydebank, on August 8. The machinery of both vessels is being manufactured by the builders of the hull. Only one of the eight destroyers in this program has yet been launched, the *Anthony*, on April 24; but the *Ardent* is due to be launched at Greenock on June 26 and the *Active* at Newcastle on July 9. The other vessels are the *Arrow*, *Achates*, and *Acheron*, which were laid down in August, September, and October, 1928, respectively.

Submarine

London *Times*, June 11.—The launch of the submarine *Parthian* at Chatham Dockyard has been fixed for June 22. This is the fourth submarine built there since the war. The large special type vessel *X 1* was begun in 1921; the *Oberon*, of a general service type, in 1924; and the *Odin*, of similar design, in 1927. The *Odin* was one of the first group of six submarines which are being built annually under the replacement program of 1925. The *Parthian* belongs to the second group of that program authorized in 1927. There is a third vessel allotted to Chatham, the *Rainbow*, which belongs to the 1928 quota, but is not yet laid down.

New Submarine Depot Ship

London *Times*.—The trials have now been begun of H.M.S. *Medway*, which has been built by Vickers-Armstrongs, Limited, at their Barrow works to fulfill an urgent need for a larger and better-equipped submarine depot and repair ship. The *Medway* will take the place of the *Maidstone*, built in 1912, and employed throughout the late war as parent ship of the flotilla working from Harwich. In her design and equipment there have been introduced many novel features as a result of experience gained during and since the war. Her resources and accommodation are such as to make her probably the most spacious and efficient vessel of her kind in any navy, and it is no exaggeration to call her a floating submarine base.

Submarine service, it need hardly be emphasized, is very arduous and exacting and conditions on board the vessels are such that it is essential to provide an opportunity for their officers and men to rest and recuperate after a spell of duty. The existence of a ship like the *Medway* obviates a return to base for this purpose. During the war, it may be recalled, it was the practice to remove the crew of a submarine of the Harwich force after they returned from a patrol of a week or ten days in enemy waters, and they lived in the depot ship until needed for another patrol. But the accommodation in the *Maidstone* proved inadequate, and a shore establishment facing Parkeston Quay became necessary. This was satisfactory while the

sphere of operation of the boats was limited to the lower part of the North Sea. Today, when the flotilla may be required in various parts of the world—China or the Mediterranean, for instance—it is essential to its mobility to have a properly equipped depot ship.

The submarines recently built are more than twice as large as the "E" class of 1914, and probably have twice as many officers and men as the "30" in that type. Consequently, the provision for a similar number of boats has to be on a larger scale. The *Medway* is 580 feet long by 85 feet broad, with a loaded draught of 23 feet, as compared with 355 feet, 45 feet, and 16 feet respectively in the *Maidstone*. In her design special attention has been paid to protection against underwater attack. The only armament in the ship is a light defensive one, consisting of two 4-inch quick-firing guns and four 4-inch antiaircraft guns. In the *Maidstone* there were no guns.

Mooring Facilities

An outstanding feature of the *Medway* is that a large number of submarines can make fast to her at one time. This has been done by providing numerous bollards and fairleads on the decks and recessed mooring plates in the ship's side. The vessels would be arranged in groups, leaving one portion of the depot ship clear to receive tenders for stores, or for a submarine requiring special attention. The problem of mooring the ship with submarines alongside has had special attention, and three 160-hundredweight anchors are fitted at the bow and one 60-hundredweight anchor at the stern. Special means for protecting the propellers from damage while submarines are moored or maneuvering alongside include the use of propeller guards and 7-ton floating fenders. A complete outfit of bow protector gear is also fitted, consisting of four paravanes, and the two paravane winches on the upper deck for recovery purposes are also available as store winches for the light machine shop. The double bottom allows of about 2,000 tons of oil fuel being carried for attached submarines, without interfering with the vessel's own fuel capacity. Large quantities of lubricating oil and fresh and distilled water can also be carried for the use of the flotillas.

For her duties as a repair ship, the *Medway* has about a dozen workshops fitted up in the most efficient manner, such as the heavy machine shop, light machine shop, plate shop and smithery, torpedo, ordnance and electrical workshop, and so on. To expedite the transfer of material and work, the shops are provided with overhead runways and travelling purchase pulley-blocks. A very interesting compartment is the room for the overhaul and repair of periscopes, in which spare submarine periscopes are carried. In another room is undertaken the repair of submarine batteries, and there is a store for acid and a compartment known as the acid room. From a separate and complete system for distilling water, supplies are led to the various spaces as required. Five electric generators, driven by Diesel engines capable of generating a total of 2,800 kilowatts, supply light and power to the vessel, and special means are provided whereby the batteries of the submarines alongside can be re-charged from these generators. Separate systems of pumps and hoses are available to supply oil fuel, lubricating oil, fresh water and distilled water from the *Medway* to her submarines.

Stores and Personnel

The storerooms of the new ship present many objects of interest. Their space is sufficient to stow the provisions needed for her own crew and those of the attached submariness for 100 days. Cold-storage chambers of about 10,000 cubic feet capacity are provided, insulated with slab cork and teak linings, and fitted with brine grids, meat rails and hooks, cupboards and shelves. The accommodation for warlike stores is also very complete. Here are stowed not only ammunition and torpedoes for the submarines, but also their collision heads, gyroscopes, etc., and in a closely guarded compartment are a number of warheads in special cases. Four electric cranes are fitted for taking in stores or transferring them to submarines. Aft of the forward stump mast is a 6-ton derrick for lifting overboard heavier stores; while aft of the mainmast a heavy derrick is used for lifting the heavy power boats, which include three 35-foot motor boats, one 30-foot

motor boat, two 50-foot motor pinnaces, and two 42-foot motor launches.

Accommodation for the *personnel* has been planned with special regard to comfort, convenience and ventilation. Including crews and spare crews of submarines, there is room for over 135 officers and 1,600 men, so that when all are on board the *Medway* has a floating population of 375 persons more than the *Nelson,* our latest and largest battleship. All the officers are provided with single berth cabins, and there is adequate bath room and lavatory accommodation. There is a separate mess room for warrant officers, and an officers' smoke room is at the aft end of the boat deck. On the main deck are separate messes for the chief petty officers, petty officers, artisans, seamen and stokers. There is a large recreation space and reading room and library, and also a school room which can be furnished as a chapel. In a large and airy sick bay are thirty cots, and the medical officer is provided with separate rooms for examining, dispensing, operating and X-raying purposes. A sick ward for officers is provided near their quarters and there is also an isolation hospital and dental surgery. The *Medway,* with all that she means for the health and welfare of submarine men, and for their efficiency when on duty, is thus a very valuable unit of the post-War Navy.

New Device Effects Submarine Escape

New York *Times,* June 20,—London, June 19.—A new apparatus for the escape of trapped submarine crews was successfully tested today by the Admiralty at Loch Long, Scotland.

Wearing the apparatus, the experimenters were sunk in a chamber to a depth of 126 feet where the temperature of the water was 50 degrees with a 1¾-knott tide running and a squall above. On each test they reached the surface safely in a minute and a quarter. It was pointed out that these tests represented double the journey a trapped crew would have to make, since the testers had not only to escape and come to the surface, but had originally to get down to that depth.

The invention which weighs only four or five pounds and is attached to a man's chest, has a flexible breathing tube through which the air exhaled is regenerated by the absorption of the carbon dioxide and the restoration to it the requisite amount of oxygen.

Another invention tested at the same time is a diving aparatus which, it is contended, beats the world's record for depth, permitting the diver to descend 300 feet. The previous record was 204 feet.

The principle of this invention is that it reduces to one-third the former time of decompression and freedom from the effects of nitrogen. It is a cylinder which is lowered as soon as the diver is ready to come up to the depth at which decompression must begin. The attendant goes down in this chamber and helps the diver into it and then disconnects his impediments, so that he can rest comfortably while the necessary decompression period elapses. Oxygen, hot drinks and other comforts are also provided.

The main advantage of this apparatus is that it does away with the heavy diving armor which, though it permits deep descents, cramps and limits the movements of the diver.

Both inventions were submitted to the Admiralty by the Siebe Gorman Company, Ltd.

FRANCE

New Destroyers

Naval and Military Record, May 29, (by J. B. Gautreau).—Parliamentary work has just been resumed, and the question of the new shipbuilding program is expected to come up shortly for discussion. Meanwhile, commendable activity is being displayed. Vessels are being every week launched and being replaced on the stocks by new units. Such regular work and continuous effort are unprecedented in the Marine Française, and this justifies the prevailing optimism. New ships are showing creditably the tricolour all over the world. Admiral Decteur, with an up-to-date squadron, is visiting Barcelona. The 10,000-ton *Duquesne* is touring around Africa, and staying for a while in the splendid Diego-Suarez (Madagascar) point *d'appui,* whilst the *Tourville* is paying a lengthy visit to Chile in the course of her around-the-world cruise.

The belated 1,500-ton torpilleur d'escadre *Basque,* of the 1925 program, has just been

launched in an advanced stage of completion at the Seine Maritime Worms Chantiers, near Le Havre, a recently-created yard that is new to warship construction. The *Brestois* (Nantes) and *Boulonnais* (Caen), belonging to the same program, have been ready for over a year and have undergone successful trials. The *Basque* will enter the service after the four torpilleurs of the 1926 program (*Forban, Fougueux, Frondeur,* and *Foudroyant*). The eight vessels of the 1925-26 programs that will be the last boats of the so-called "torpilleurs d'escadre" type (but in reality powerful destroyers of the flotilla-leader class) form one class and promise to be satisfactory, as they embody the data gained through the service tests and comparative experiments of the eighteen *Simouns* and *Railleuses.* Superstructures and funnels have been reduced and stability conditions much improved, while boilers (three in number) and turbines (of the Parsons and Rateau patterns) have gained, and also the rate of fuel combustion and radius of action. Weak points in the hull and in the internal installations have been carefully remedied to the advantage of the all-round robustness and sea-keeping endurance. Possessing the hull lines and silhouette of the 10,000-ton and 8,000-ton cruisers of the *Tourville* and *Primauguet* classes, with a length of over 330 feet, they behave well (as shown by the tests of the Brestois) in rough weather, and will be able to use their high-perched guns in about the same conditions as light cruisers do; and it must be borne in mind that their shells (capped) are heavier by one-third than the projectiles of Italian or British destroyers. Their speed is modest on paper, not exceeding 33 knots, but in practice they will more than hold their own with 35-knot destroyers of inferior size and robustness, although the latter will have the advantage for short runs in ordinary weather. Such, at least, is the opinion of Paris experts, who hold that the true criterion of the value of fighting ships is to be seen at sea, and not on paper.

The twenty-six French 1,400-1,500-ton torpilleurs d'escadre will next year become available—everyone of them—and prove the most homegeneous and powerful post-war destroyer force. They will have over all-comers superiority of caliber and range. Their 130 mil. guns fire 33 kilo shells at ranges of 19,000 meters. This confers on them a distinct advantage over most destroyers of other navies. Even in flotilla actions, against unarmored hulls, heavier shells tell a good deal by virtue of their larger exploding radius and smashing power. Gun-range experiments have been conclusive on that point, and the same is true of the experience of the war. In destroyer fights in the North Sea and in the Adriatic French gunners felt handicapped by the shortcomings of their 100 mil. weapons, though the latter caliber was just as good as the British 4 in. ordnance. A projectile having stopping power when hitting the target and likely to secure first blows is what they have all along wanted since the war, and what they are confident they have got in the 130 mil. guns arming the whole of their torpilleurs d'escadre, in addition to the six 2,400-ton contretorpilleurs of the *Tigre* class, thus thirty-two units in all.

English war experience with destroyers has been different. British boats were larger than the French and better armed, besides being generally supported in action by light cruisers that had no counterpart on the French side. Moreover, the eventual use of massed torpedo attacks by destroyers is ever in the mind of those pugnacious British naval men who are refighting Jutland in imagination or meditating about the Jutlands of tomorrow. And for torpedo work destroyers as small as is compatible with sea-keeping power and speed are what is wanted. These desiderata are met, and excellently, by the post-war *Ambuscade* and *Amazons,* that are smaller by some 200 tons, than the *Simouns* and *Railleuses.* The French so-called contretorpilleurs of the wartime, such as the *Casque* and *Bouclier,* of 750 tons, exceedingly successful on paper, have proved in the hour of need sorely disappointing because too fragile. Hence the resolve of French experts to have robustness with reliable sea speed, even if it should be at the cost of paper achievements. It must be added that Paris naval authorities are of the opinion that future wars will see no "Jutlands," no more "batailles rangeés," but plenty of surprise actions under cover of darkness or fog, artificial and otherwise. Individual power will then tell in destroyers.

Preliminary Trials of the "Verdun"

Naval and Military Record by J. B. Gautreau.—The 2,700-ton *Verdun* (sister ship to the *Valmy*), built by the St. Nazaire Loire Chantiers, has under the command of Captain Richard, commenced the series of her preliminary trials off Lorient, attaining thirty-five knots in rough weather with little over 50,000 h.p. As she is expected to develop at least 75,000 h.p. at full power she ought to equal her sister *Valmy*, that broke all records, maintaining 39.85 knots for two hours. Keen emulation prevails on board the new grayhounds. Great disappointment would sadden the hearts of the *Verdun's* crew if forty knots were not ultimately attained on full-power trials.

Captain Richard will have under his command within the next three months the fastest and most powerful three-ship escadrille in the world. It will comprise the *Guepard*, of 38.45 knots, with 73,000 h.p.; the *Valmy*, and the *Verdun*. These 3,000-ton (at full load) super-destroyers mount five 138 mil. guns with an extreme range of 25,000 meters (under 45 degrees angle) and capped shells of some 40 kilos. In truth, they carry cruiser armament, and would have a say at any practicable fighting distance against any unarmored cruisers. They are seen to be better armed than were the German pre-war cruisers of the *Emden* and *Breslau* classes of 4,000-5,000 tons, that only mounted 105 mil. guns. Their ballistic superiority is obvious over all existing destroyers armed with 102 and 120 mil. weapons. On paper, at least, they would be in a position to secure the first hits. In the light of war lessons this initial advantage constitutes a primary asset of victory.

Launchings

The Nautical Gazette, May 25, by M. M. Desclaire.—Seven war vessels, four for France and three for Poland, were launched from private yards in April, the French ships being the airplane carrier *Commandant Teste* of 11,500 tons displacement, built by the Chantiers de la Gironde, of Bordeaux, which is the first French vessel specially designed for the transport of hydroplanes; the 33-knot destroyer *Foudroyant*, displacing 1,500 tons, built at the Chantiers Maritimes du Sud-Ouest, of Bordeaux and the 1,560-ton submarines *Argo* and *Acteon*, ordered from Nantes yards. The Polish vessels consist of three submarines of 980 tons displacement each, the *Wilk*, launched from the Augustin Normand yard, Havre; the *Burza* (Chantiers Navals Français, Blainville, Caen), and the *Rys* (Chantiers de la Loire, Nantes).

ITALY

Navy Equal to France's

Baltimore *Sun*, June 16.—Rome, June 16 (A.P.)—Mussolini and his Fascist Ministry of Marine are bringing the Italian Navy up to a high point of efficiency at a time when Italian newspapers are crying, apropos of the Preparatory Disarmaments Conference at Geneva:

"We want a navy equal to France's."

Mussolini, who is himself Minister of Marine, said in an election campaign speech:

"Before 1922 the sea was neglected. The régime has renewed Italy's possibilities there."

Recent figures bear out his contention, for by 1932, when the naval program now in course of construction is completed, Italy will have forty-three new ships of light-cruiser class and destroyers of a total of 118,400 tons; twenty-seven new submarines, of 24,950 tons, and ten special ships of 32,700 tons, a total of 80 units and 176,490 tons.

Since the Fascist régime began, the need of light, fast cruisers in preference to battleships has been emphasized. If Italy should go to war with a country of considerable naval strength, her fighting would have to be done on the Mediterranean and its component seas, the Ligurian, Tyrrhenean, Ionian, and Adriatic. This fact, coupled with her long bootlike coastline, means she must have a fast navy capable of rushing from one strategic point to another.

It is significant of the changed tactical theory that no dreadnaughts have been laid down since 1913, sixteen years ago. The *Andrea Doria* and the *Duillio* were completed in 1915, just before Italy entered the World War.

Within only the last few weeks Mussolini announced the impending construction of four new cruisers, two being of the *Trento* (10,000-ton) type and two being lighter.

The execution of the new program involves, up to the end of 1929, an expense of 1,282,000,000 lire, nearly $100,000,000.

At the same time the Duce is bending every effort to make the Italian Navy possibly the strongest in the Mediterranean, even taking into consideration the Mediterranean divisions of the French and British navies. He is likewise concentrating considerable attention on shore defenses.

Observers say, too, that Mussolini has inspired his navy with a new spirit. King Victor Emmanuel referred to this fact in his opening address to Parliament.

"You will be asked," he said, "to provide new and further material means for the national defense. The spirit is already there."

New Construction

Le Yacht, May 25.— The Italian government has officially announced that, in June next, the following ships will be laid down: two 10,000-ton cruisers, two 5,500-ton cruisers of the *Condottiere* type, four destroyers and five submarines. The total tonnage of these ships now reaches 37,000 tons.

Just now, private yards are building the *Fiume* at Trieste, and the *Zara* at Spezzia. The Castellamare Yards are building the *Bande Nere* of 5,500 tons and the Ansaldo Yards are building three cruisers of the same type. In the drydocks of Monfalcone there are six large submarines.

The *Fieramosca,* the largest submarine of the Italian Navy, was launched at Taranto. The main characteristics are: displacement, 1,500 tons on surface, 1,800 submerged; The *Fieramosca* is equipped with six torpedo tubes and, in addition to the six torpedoes in the tubes, eight reserve torpedoes can be carried. The ship also has two mine laying tubes and a stock of twenty-four mines. It is equipped with an anti-aircraft and anti-torpedoboat gun of twenty mm and with several machine guns. Finally, its chief innovation consists of an enormous airtight tube running toward the stern and intended to hold a hydroplane.

MERCHANT MARINE

Launching July 10 for Pennsylvania

New York *Times,* June 13.—The turbo-electric liner *Pennsylvania* of the Panama-Pacific Line, largest commercial ship ever built in the United States and the largest electrically-driven liner in the world, will be launched at noon on July 10 at the yards of the Newport News Shipbuilding and Drydock Company, it was announced yesterday. She is the third and last of the ships projected by the company in a program that involves the expenditure of $21,000,000. The others are the *California* and the *Virginia,* which are now operated in the intercoastal service.

The *Pennsylvania* has a gross tonnage of 21,000. She is 613 feet long, 80 feet beam and 100 feet deep from keel to upper deck. She is designed to carry more than 800 passengers, 400 first class and 400 in tourist cabin. All of her staterooms are outside, many of them equipped with private baths and showers.

She will be a duplicate mechanically of the *Virginia,* but will have facilities for handling 8,000 more tons of freight. Her electric propulsion energy will be furnished by twin turbines creating a current estimated at 20,000 horsepower. This energy transmitted by two great motors, each attached to a shaft of her twin screws, will give the ship a maximum speed of 21.75 miles an hour.

The new ship will supplant the *Mongolia* in the intercoastal service, following the policy of the line to establish a fortnightly service of new ships between New York and the Pacific Coast. The *Pennsylvania* will make her maiden trip from New York on October 19.

The interior decoration of the ship is on the style of the old mansions of Philadelphia. The paintings and murals of the foyers, lounge, smoking room and library will portray persons and places associated with the Colonial days of Pennsylvania.

Miss Eleanor Jane McCarthy, twelve-year-old daughter of A. J. McCarthy, general manager of the Panama-Pacific Line, will christen the ship as it slides down the ways. Officials of the line and guests will leave New York on the night of July 9 by special train to witness the ceremonies.

New Ships

The Washington *Post,* June 27—In the old days when the Yankee skippers sailed their ships to foreign ports, the United States stood supreme as a maritime power. American skippers were daring seamen. Their ships were the speediest afloat. Be-

cause these ships were speedy and their masters competent to sail in weather that made others reef their sails, the Yankee clippers faced little competition. They were the preferred vessels. Today, the United States is endeavoring to reestablish her merchant marine and it is generally recognized that the factors that built supremacy in an earlier day must be duplicated if dominance is to be won today.

The United States Lines recently were transferred by the Government to private control and it is around the former Shipping Board vessels as a nucleus that the new American merchant marine will be built. Under the terms of the contract of sale, the United States Lines agreed to build new vessels the equal of any that sail the Atlantic, and in April a committee of design was created to plan for two new ships. It was recently announced that plans and models of two new vessels have been completed, and that the models are to be tested in the ship model testing basin at the navy yard.

The new vessels will be similar in design to the *Leviathan*, flagship of the United States Lines, but their lines will be refined to give them the speed necessary to compete with the *Bremen* and the *Europa* which are expected to be the speediest vessels on the Atlantic. It is believed that the new vessels of the United States Lines will make 27 knots or better as compared with the 26½ knots of the *Bremen* and the *Europa*. The new vessels will be of about 50,000 gross tons each which, while slightly under the tonnage of the *Leviathan* and the *Majestic*, will enable them to equal or surpass the earning power of the two older ships in view of the fact that modern ship building methods make possible big savings in weight without sacrifice of structural strength. They will range from 900 to 1,000 feet in length with a beam somewhat narrower than that of the *Leviathan*, and they will be built to meet and even exceed the most stringent regulations for safety of life at sea. Their keels are to be laid in February, and they will cost, completed, between $50,000,000 and $60,000,000.

The American merchant marine has been reduced to such a sorry state that it is gratifying to witness signs of activity that promise to lead to its resuscitation. It is economically vital that there be American bottoms to carry American exports and passengers and it is highly important to the national defense that there be created an efficient, well-rounded merchant marine. The new owners of the United States Lines are proving that their promise to lead the way to maritime prominence was not idle. The designing and building of the new vessels will be watched by the American people, not as an interesting commercial development, but as a matter of national importance.

Sea Speed Record Sought by Bremen

New York *Times*, June 16, by T. Walter Williams.—The most important event in the history of the North Atlantic passenger trade since the entry of the first superliner *Imperator* into the service, in the spring of 1912, will take place next month when the 45,000-ton North German Lloyd liner *Bremen* starts on July 16 on her maiden voyage to New York.

The North German Lloyd management is confident that the *Bremen* will average twenty-seven knots per hour in fine weather and that she will capture the blue ribbon of the Atlantic from the Cunard liner *Mauretania*, which has flown the fastest vessel pennant at her mainmast head for twenty-two years.

Every modern invention for the safety and comfort of the passengers of all classes has been installed in the new German liner, but the main object it has been hoped to achieve is speed. By making the voyage from New York to Cherbourg under five days the North German Lloyd would be able to land passengers in Italy within seven days by running them through from French ports in special trains.

Before the World War one of the most profitable sections of the North German Lloyd passenger business was the second and third class through traffic to Italy. This has been captured since 1918 by the large fast liners of the Lloyd Sabaudo and Itala-American lines. These companies, whose ships make the voyage to Naples in nine days, are waiting to see what the *Bremen* does and then will probably try to build a ship to beat her.

The Cunard Line management at Liverpool has several plans for a new fast ship and is also awaiting the result of the *Bremen's* first trip next month. The 60,000-

ton White Star liner *Oceanic*, which was laid down at Belfast last year to be built as a Diesel electric ship, is also being held back after 700 feet of keel has been constructed and the shipyard lengthened to 1,500 feet to give plenty of room to build her.

An experiment in Atlantic shipping has been made in the *Bremen*, which has a "bulbous" bow—that is, a large blister on each side, just below the waterline, extending fifty feet and tapering off aft. This, it is believed, will have the effect of decreasing the skin friction and reducing resistance to the water.

To add further to the chances of increased speed the North German Lloyd vessel's two big funnels are shorter than is customary and are elliptical to decrease wind resistance. Even the corners of the superstructure have been rounded off and are tapering instead of square.

ENGINEERING AND RADIO

Radio Beacon Set Up at Mitchel Field

New York *Times*, June 9.—The first radio beacon in the Eastern part of the United States passed its final tests yesterday at Mitchel Field, Long Island. The beacon can guide fliers to and from the field within a radius of 400 miles by day and 1,500 miles by night. It is the fourth to be installed at army flying fields. It is pronounced invaluable for use in fogs.

Operated automatically through a device known as a "goniometer," the beacon sets a wireless path for any airplane equipped with a receiving set. The center of the beacon's course is marked by a series of Morse code dashes interspersed with the letter "M," the beacon's signal. Should the plane veer to the right it falls into an ether path marked by the dot-dash of the letter "A," while if it inclines to the left of the true course, the plane is warned by a series of dots making the letter "I."

The beacon apparatus consists of the goniometer, which can be set for any direction, housed in a small building at the northeast corner of the field. Topping it is an eighty-two foot tower, and radiating from this tower are rows of poles carrying heavy wires toward the four points of the compass.

Officials at the field explained that the path marked by the beacon is so definite that it embraces an area only three miles wide at Bolling Field, Washington.

The beacon was erected by Captain Clayton Shangraw, United States Army Reserve, and is in charge of Lieutenant William B. Hough, signal officer of Mitchel Field. Lieutenant James Doolittle, now with the Guggenheim Fund, and Captain Shangraw aided in yesterday's final tests, during which an airplane was accurately guided over Long Island.

The radio beacon first attained great prominence as an important factor in flying when Lieutenants Lester J. Maitland and Albert F. Hegenberger of the Army Air Corps made the first non-stop flight across the Pacific from Oakland, California, to Honolulu in June, 1927.

Their course was laid by beacons erected by the army at San Francisco and Honolulu and, due to favorable atmospheric conditions on the 2,400-mile journey, Lieutenant Maitland said that at one time they could hear both beacons simultaneously.

AVIATION

New Cooling Process for Water-Cooled Engines

The Aero-Digest, June.—The real significance of the new cooling system recently developed by the Army Air Corps can be appreciated when one considers that the method will tend to increase the efficiency of operation of aircraft equipped with water-cooled engines, in such respects as reduction of weight of the engine, increase in speed of plane made possible by the utilization of smaller radiators offering less head resistance, and reduced fuel consumption. The upright or inverted "V" or "in-line" types of engines are particularly adapted for use of this system of cooling.

It is not at all unlikely that many multi-engined airplanes of the future will increase their speeds ten per cent and their pay loads by several hundred pounds through the employment of the new cooling, combined with wing radiators of minimum resistance. Aircraft of the pursuit or speed type may find this a great boon as well. The greater the speed, the greater will be the increase due to such reduction of resistance of speed.

Although the new type cooling system is

still in the experimental stage, service tests on the dynamometer and torque stand, as well as actual flight tests, indicate that the Air Corps is fully justified in continuing research and development work along this line.

The liquid used is known as Ethylene Glycol. When substituted for water in the jackets and radiators of an engine it can be operated at outlet temperatures of 300 degrees instead of 180 degrees Fahrenheit, permitting the use of a radiator of only about one-fourth of the size now required. Ethylene Glycol is the first and simplest member of the class of polyhydric alcohols. It is a clear, colorless, odorless fluid, boiling at 387 degrees Fahrenheit and has a slightly sweetish taste. Its chemical formula is CH_2OH. In structure and characteristics it resembles somewhat both ethyl alcohol and glycorol and occupies an intermediate position between the two. Due to its extensive use as an anti-freeze by the automotive industry, it has now become commercially available at relatively reasonable prices. It is not a newly discovered liquid, but its use in connection with high temperature cooling is a new development. During the past winter this product was sold under a trade-name at many garages and service stations as an anti-freeze.

Certain changes are found necessary when Ethylene Glycol is used as a cooling medium in engines already constructed. In general, joints and packing glands must be tighter and a closed cooling system used. The expansion of Ethylene Glycol when it becomes hot is somewhat greater than that of water, necessitating the allowance for a larger expansion space. The fuel supply should generally be treated with an extra amount of benzol, tetra-ethylene load or other anti-knock preparation to offset any added tendencies toward detonation.

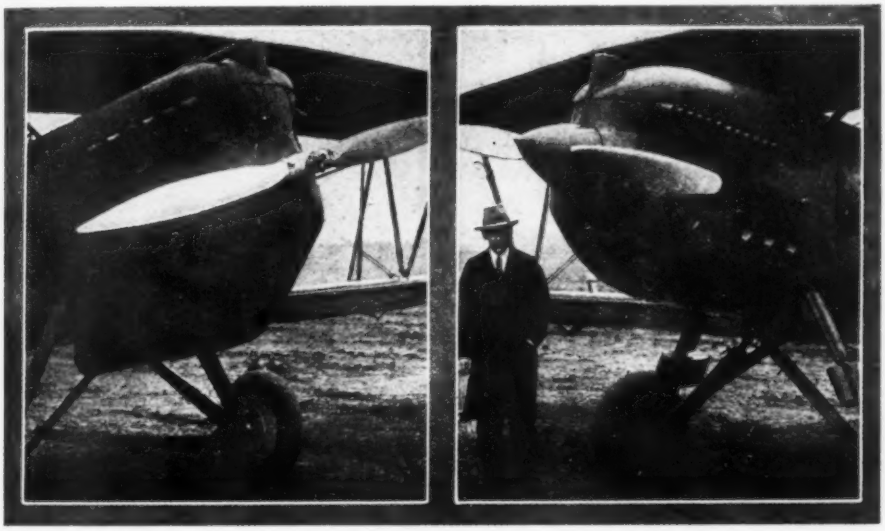
For many years the majority of internal combustion engines have used water in circulation as a medium of carrying away the excess heat produced. From the first flight of Orville Wright in 1903, the radiator has been a perplexing problem to aircraft designers. Not only has its weight reduced the useful load of the airplane, but its resistance to flight was paid for in miles per hour.

In the ordinary system, 180 degrees Fahrenheit is the generally accepted maximum temperature considered for reliable operation, because the cooling water will boil away at 212 degrees. This gives a temperature difference of 120 degrees when operating in the air of 60 degrees Fahrenheit. By using Ethylene Glycol, the outlet temperature of which may be 300 degrees due to its high boiling point, the temperature difference becomes 240 degrees instead of 120 degrees. It is this difference which permits of a much smaller radiator to accomplish the same degree of cooling. The increase of engine operating temperatures within certain limits will in probability make for certain fuel economies which in turn may appreciably increase the flying radius and pay load.

By reducing the resistance to the air and decreasing the weight, an airplane will carry a greater load at a greater speed. The liquid Ethylene Glycol accomplishes both desired results. For the military machine it means greatly increased performance and for the commercial type a greater pay load. The ordinary radiator used in a modern pursuit plane, for example, weighs 66.5 pounds, and its cooling water 112.5 pounds, total 179 pounds. The radiator often represents as much as 20 per cent of the total resistance of the airplane. By replacing it with one of 25 per cent capacity and filled with Ethylene Glycol, the results attained are surprising. The radiator resistance is cut to a fraction of its former value, 100 pounds are saved in weight and the speed of the airplane is increased by 11 miles per hour. By using small wing skin radiators in place of the new one-fourth size radiator, the speed is increased 15 miles per hour above that of the standard pursuit plane with the present conventional radiator. Such a reduction of necessary cooling area may make practicable the use of wing skin radiators used formerly on racing airplanes only.

Quite a number of flights have been made by Air Corps pilots, using the new process at temperatures up to 300 degrees Fahrenheit (outlet). During recent tests in which a Curtiss Pl-B type airplane, mounting a 420 horsepower Curtiss D-12 "V22" engine was used, the radiator was somewhat larger than the computations indicated as necessary, being about one-third the size of the

radiator generally used as standard on this machine. Several test flights were made during which the maximum temperature of the cooling liquid was recorded as 270 degrees Fahrenheit. This occurred after ten minutes of full throttle operation at 2,000 feet. The airplane, relieved of approximately 90 pounds weight of radiator and cooling liquid, appeared to possess better flying qualities than previously. The operation was considered satisfactory and indications were that the oil temperature under these conditions will run somewhat higher, a problem which can easily be solved by the use of a different oil or an oil cooler.



COMPARISONS SHOWING CURTISS FALCONS WITH REGULAR RADIATOR AND NEW SMALL TYPE

A few weeks after the announcement by the Army Air Corps that its engineers had proved Ethylene Glycol, known by the trade name of Prestone, to be a cooling fluid superior to water, the Curtiss Aeroplane and Motor Company took the lead among airplane manufacturers in using the new fluid by installing, for the first time on any commercial plane, a Prestone cooling system on a Curtiss Mail Falcon, powered with a Curtiss Conqueror 625 horsepower engine.

The most striking results of the installation was the reduction of the radiator to approximately one-quarter of its former size, due to the fact that only 4½ gallons of Prestone are required to cool the engine, whereas eighteen gallons of water had been necessary. In consequence, the frontal area was greatly diminished and the general aerodynamic efficiency of the ship much improved. The saving in weight amounted to approximately 125 pounds.

Details of R-101 Construction

Aviation, June 8, London, England.—The *Aeroplane* recently described some of the interesting details of the R-101, sister airship to the R-100, both of which are nearing completion at Pulham. Frame 1 carries a hinged platform or gangplank which may be lowered for entry of passengers from the mooring tower. The passengers reach their cabins from this platform by means of a stairway in the corridor 2 feet 4½ inches wide along the port bottom longitudinal girder, which is walled with fabric and lighted by electric lamps every 25 feet. Frame 3 is a novel type of ring without radial bracing, which is peculiar to this design, as are all other frames to and including frame 13.

Frame 4 carries two power cars. Frame 5 carries a ladder way to a cockpit on top of the dirigible. Frames 6, 7 and 8 carry passenger cabins. Frame 9 carries two engine cars. Frame 11 carries a single engine car. Frames 14 and 15 carry the

pin structures. There are fifteen main longitudinal girders which are located entirely outside the transverse frames. There are fifteen intermediate longitudinals, which are to aid the main longitudinals in carrying the lateral loading caused by the outer cover. There are sixteen gas bags.

First Seadrome

Western Flying, June.—The first of seven Armstrong seadromes is under construction at Chester, Pennsylvania, and may be finished within six months. It will be anchored about half way between New York and Bermuda, or 375 miles from New York, and is intended as a shuttle terminal for the north Atlantic string of seadromes that will lead planes to Europe via the Azores.

Every engineering detail has been worked out on the drome. It is 1,200 feet long, 200 feet wide at the ends, and 400 feet wide at the center. It is similar to the deck of aircraft carriers in appearance, although much longer and wider. It displaces 25,000 tons and has a draft of 160 feet, which prevents rolling in a heavy sea.

The Parnall "Pipit"

The Army, Navy and Air Force Gazette.—The Parnall "Pipit" is a single-seater ship's fighter, fitted with a Rolls Royce F. type engine. The lines are clean, and extraneous resistances have been reduced to a minimum. It is of "all-metal" construction with stainless steel and duralumin as the chief structural materials. Land and seaplane undercarriages are quickly interchangeable. They are self-contained units, attached to the fuselage at common fixing points. All cowling and fuselage fairing from the nose to the tail is quickly detachable.

The armament consists of two synchronised Vickers guns, fixed on either side of the pilot at seat level with the barrels protruding into troughs in the fuselage sides. Provision is made for carrying bombs under the lower planes.

A short-wave wireless set, working on a fixed aerial, is located immediately behind the pilot, and the oxygen apparatus. Very pistol and other service equipment are disposed around the cockpit.

The cockpit is said to be free from draughts at all speeds, and sufficient heat is supplied by the retractable radiator to obviate the necessity for electrically heated clothing up to 20,000 feet under winter conditions. A controllable vent regulates the temperature in hot weather.

Details of the performance with Rolls-Royce F.XII.S. engine cannot yet be made public. The machine has a very good

A SINGLE-SEATER SHIPBOARD FIGHTER
The Parnall "Pipit" biplane (Rolls-Royce F type engine).

range with the Rolls-Royce F.XI engine. The slow alighting speed—55 m.p.h.—and the servo actuated brakes, which act independently on either wheel, simplify the problem of deck landing.

The Avro "Antelope"

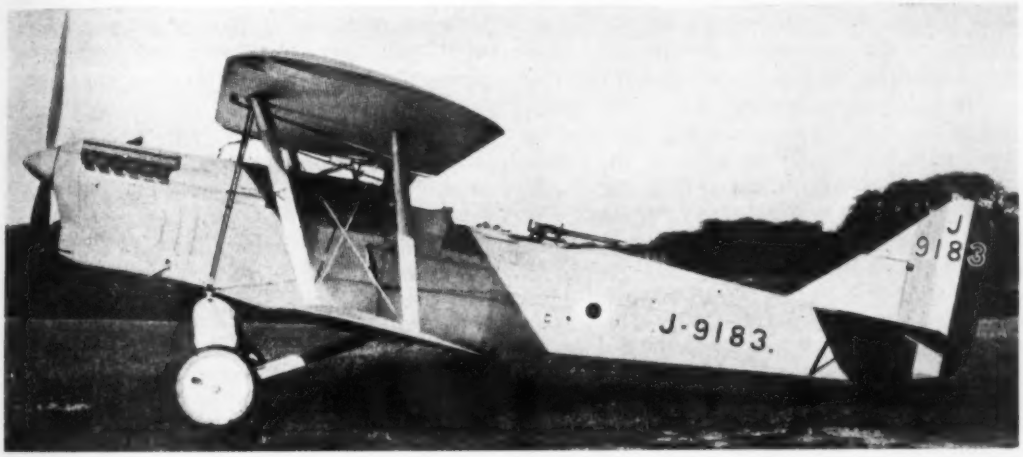
The Army, Navy and Air Force Gazette.—Designed by A. V. Roe & Co., Ltd., of Newton Heath, Manchester, the "Antelope" is a high performance day bomber of all-metal construction. Though designed particularly for this purpose, it has so high a performance and such excellent maneuverability that it is equally adaptable for use as a two-seater fighter, and may also be employed for reconnaissance or similar service.

The "Antelope" is a single bay biplane of the type having a lower wing smaller in chord and span than the upper. The upper wing is in two sections jointed on the centre line of the machine, and there supported by inverted "Vee" struts. At these struts the upper wing is cut out and thinned in section, so that the view of the pilot, whose cockpit is just behind the rear pair of struts, shall be as little impeded as possible. Ailerons of Frise type are fitted to the upper wings only.

The pilot's seat is adjustable in height, so that pilots of varying height may secure the best possible view, and may vary the relative position of their eye level when in the air to obtain the particular view that best suits the needs of the moment. Aft of the pilot is the seat for the rear gunner or bomber. This is at a slightly lower level than that of the pilot and has also an adjustable seat. A special gun-ring of Avro design is fitted to this seat. Below this is a prone position for bombing.

The welded steel tail unit is of normal monoplane type with tail-plane adjustable in the air and balanced rudder.

The undercarriage is of the "Vee" type with a telescopic front leg to each Vee. Rubber in compression plus an oil dashpot are used for springing and shock absorbing.



AN ALL-METAL DAY BOMBER
The Avro "Antelope" biplane (Rolls-Royce F.XI.B. engine).

A laminated spring fitted with a renewable shoe of chill cast iron serves as tail skid.

The power plant consists of one Rolls-Royce F.XI.B. engine developing 538 b.h.p. at 3,000 feet, cooled by an underslung radiator. Main and gravity fuel tanks are inside the fuselage close behind the fireproof bulkhead which separates the engine from the interior of the body.

Bombs are carried in racks below the lower ring.

The fuselage is built on duralumin channel section members covered with riveted-on duralumin sheet. The wings have spars and ribs of the same alloy, with fittings of stainless steel, and is covered with doped linen fabric.

The top wing is of 36 feet span and 7 feet chord, the bottom of 32 feet span and

5 feet chord, giving a total area of 377 square feet. The overall length is 31 feet 2 inches, and the overall height 10 feet 9 inches. Empty, the "Antelope" weighs 2,687 pounds, of which the aeroplane structure proper contributes 1,350 pounds, and the power plant, including the engine, exhaust pipes, radiator, water, airscrew, fuel, oil, and water tanks, and other accessories the remaining 1,337 pounds.

Bombs and bomb gear weigh 391 pounds, guns and their gear 176 pounds. Parachutes, instruments, oxygen apparatus, wireless and electrical equipment, and similar items weigh 177 pounds. With a further 360 pounds for the crew of two the total weight is 4,539 pounds, giving wing loading of 12 pounds per square foot and power loading of 8.4 pounds per h.p.

The duration of flight at a cruising speed of 150 m.p.h. is four hours, and the landing speed with a full load 60 m.p.h. The maximum speed at 5,000 feet is 173 m.p.h., at 10,000 feet 167 m.p.h., at 15,000 feet 157 m.p.h., and at 20,000 feet 136 m.p.h. The time to climb to 5,000 feet is 3.6 mins., to 10,000 feet 8.2 mins., to 15,000 feet 15.5 mins., and to 20,000 feet 32.3 mins. The service ceiling is 20,700 feet, and the absolute ceiling 22,500 feet.

The Fleet Air Arm

The London *Times*, May 13.—The large cruiser *Glorious*, which is reconstructing as an aircraft carrier at Devonport Dockyard, will be ready to commission on October 22 for sea trials and is ordered to receive on that date a full engine room complement and two-fifths' upper deck complement. She should be ready to join the seagoing fleet about January next. This will bring up the total of large carriers in the Royal Navy to six, the others, being the *Argus, Courageous, Eagle, Furious* and the *Hermes*. No further ship of this kind is likely to be completed for some time, as, although it was proposed to lay down a new carrier in the present financial year, the vessel was struck out of the programme.

MISCELLANEOUS

Value of Speed

The Naval and Military Record, May 29, By Sir Herbert Russell.—The prize of the United States Naval Institute for 1929 has been awarded to Lieutenant Franklin C. Percival, U.S.N. (retired), for an essay upon "The Speed of Battleships." Without the least expectation of getting a prize myself, I propose to survey the subject in a wider scope than he has done. Lieutenant Percival has set himself a very difficult task and has carried it out with much ingenuity. The United States Navy has never gone beyond 21 knots in its capital ships. We have gone to 25 knots for battleships and 32 knots for battle-cruisers, of which America possesses none. In our present-day battle-fleet the minimum speed is 23 knots. Many students of naval strategy and tactics in the United States have openly confessed to the view that this superiority of speed confers a definite advantage upon the British in a comparison between the two Fleets. But Lieutenant Percival thinks otherwise, and his prize essay is devoted to demonstrating that the United States is right in being satisfied with 21 knots and that we are misguided in wanting more.

It is an elementary axiom in logic that the whole structure of reasoning, however brilliant, depends upon the soundness of the premise upon which it is based. You may go on deducting ratiocinatively ad infinitum, but if your starting point is false or faulty all the arguments in support of it are merely traveling the wrong road. They will establish a conclusion on the strength of an assumption which is incorrect. I do not mean to say that Lieutenant Percival starts his essay with a wrong premise, but I do suggest that it is a defective one, and that consequently this defect under-runs his well-sustained line of reasoning. Speed obviously is a definite tactical asset. The only thing about it which is not definite is the precise value of it in relation to the other individual factors of fighting efficiency which combine in that compromise, the capital ship. In other words, what price is worth paying for an advantage of speed, assuming that it can only be purchased at the sacrifice of other qualities upon a given limit of displacement? The Germans, of course, found an easy way of answering this question, with the result that at Jutland Admiral Jellicoe discovered their latest ships to be faster than he had expected. Germany was content to design her battleships for fighting near home. Therefore the question of fuel endurance did not

bother her. The great saving of weight affected by restricting cruising radius was utilized in machinery power and protection. Neither ourselves nor the United States could possibly compromise with sea-keeping endurance in this way.

I assume, although he does not say so, that Lieutenant Percival would admit that, all other features being equal, a capital ship with a superiority of two or three knots in speed would represent a better prospect of success. He is not clear as to whether he will allow that there can be any equality of other features. In the case of the great superiority of speed of the battle-cruiser, sacrifice is self-evident. She pays for her nimble heels in her lighter armor. The *Hood* is probably equal in hitting and resisting power to any battleship in the United States Navy, but her designers demanded a displacement of over 42,000 tons in order to attain this result. The fly in the ointment seems to me to be the assumption necessary to his argument that it is possible to measure equivalents in the weapons and the armor of two different powers. To say that the battleships of both carry eight 15-inch guns, and are broadside-plated with 12-inch armor, suggests an equality which may be wholly misleading in fact. Are not the Germans at present demonstrating to us, in their Panzerkreuzers, that they can produce an armor which, weight for weight, is very much more invulnerable than anything yet invented? Are they not showing us that they can turn out an 11-inch gun which has a range-power equal to our 15-inch gun? With such a demonstration of disparity in material, how can we take for granted that mere equality of numerals in calibre on armour thickness means even approximate equality in combatant effectiveness?

The value of superior speed, when it comes to the practical test, must be governed by the ability to use it. The faster ship enjoys the advantage of choosing her own range. If her adversary can shoot rather further than she can, she can close the range so as to be able to hit back. If her adversary cannot shoot quite so far as she can, she can deny her efforts to remedy this disability. She is swifter in evolution and therefore can take and maintain her bearing. The one factor likely to qualify her tactical advantage is indifferent disability. There is little question of range-choosing when neither adversary can see the other unit both are within easy hitting distance. But this becomes an argument against the very big, long, range gun rather than against speed. A 15-mile horizon is pretty uncommon at sea. With effective aerial spotting hits might be made at 30,000 yards, although amongst naval men I find almost unanimity of opinion that to open action at such a distance would amount to pitching projectiles into the sea. Speed superiority would assert itself here by steadily closing the distance.

I do not think it an unreasonable simile to compare speed superiority in a naval action with footwork in the prize ring. The boxer who knows how to use his feet as well as his fists has points in his favor. The modern naval engagement is a high-speed action. Lieutenant Percival devotes considerable space to arguing that speed produced no results of itself in the two big fights of the war—Jutland and the Doggerbank. He quotes Sir Alfred Chatfield, who commanded the *Lion* at both these actions, as saying, "If you cannot see more than 10,000 yards, it is no good having speed which would enable you to keep 25,000 yards off. You have got to come into the distance at which you can see the enemy, and when you come into that range, then the man who has got plenty of speed and no protection finds self in a very awkward position." With all respect, like most arguments which start with "If," this one is worded to carry its own answer instead of raising a question. The point about no "protection" does not arise in discussing the speed of capital ships in relation to which Lieutenant Percival quotes it. If, as I imagine, Admiral Chatfield means to imply that to unduly minimize protection for the sake of speed is to neutralize the tactical value of the latter, it is easy to agree with him. I am not attempting to argue that capital ship speed could possibly be worth any such price. I am endeavouring to follow Lieutenant Percival, who seeks to prove that the United States naval designers were right after all in being satisfied with 21 knots and that we were wrong in wanting 23 and 25 knots. Let us stick to approximately corresponding types.

With regard to the allegation that speed played no part in the Doggerbank action,

the simple truth is that there was precious little difference between the British and German forces in this respect. The *Blücher* was only good for 25.5 knots, and she was sunk. The *New Zealand* and *Indomitable* were no faster. The four ships of the "Cat Squadron" were 28-knot ships; so were the three German battle-cruisers. No doubt the ships of both sides make record spurts, but when the chased, with a long start, is practically as fast as the chaser, naturally the question of speed ceases to be a determining factor. Let us assume that the position has been reversed, we should probably have lost the *New Zealand* and *Indomitable,* for the want of speed would have been a definite factor, as it proved in the case of the *Blücher.*

It is harder to appraise the influence of speed, if any, at Jutland, which soon became a game of blind man's bluff amidst smoke and the waxing and waning of summer mist. Lieutenant Percival is justified in pointing out that the British failed to achieve a victory with superior forces on the strength of possessing faster capital ships. But he does not appear to have considered what might have happened had Sheer known that the advantage of speed lay with him rather than with his adversary. As I have already pointed out, the latest German battleships had more up their sleeves in the way of speed than Jellicoe had been led to expect, and this stood them in good stead in their turn-away evolutions. Does this not suggest that the Germans had a pretty definite idea as to the value of capital ship speed, and that they gave a practical demonstration of the soundness of that idea?

Lieutenant Percival argues that where the United States naval designers are right in being satisfied with 21 knots for battleship speed is that a faster ship must come within range if she wants to engage, and that, since victory is not to be achieved by running away, the capacity to do so is but a negative asset. But suppose an American battle fleet fell in with a hostile force of superior strength and superior speed. It might not want to accept battle at that particular time, assuming the admiral was anticipating junction with another force in the course of a few hours. If the hostile admiral knew of this expected junction, his superior speed might enable him to frustrate it. At any rate, it would enable him to force action if he desired to do so, whatever the result might be. If by virtue of their sacrifice of speed the individual American ships were more formidably gunned and heavily armored than his own ships he might not be very keen to force action. This seems to me to put the matter in a nutshell. Speed as a tactical asset is worth a price, but what price? In the battle-cruiser the figure is heavy, so heavy that admittedly this type would have to engage a battleship of corresponding displacement at a disadvantage in every respect save that of her much higher mobility. But is it not rather a case of single-track thinking to figure everything upon the decisive battle of the war, which may or may not come off? Speed means the ability to arrive at a spot of vital importance before the enemy can get there. Speed may even effect strategy. To come down to its probable value when battle is joined is a very limited method of appraisement. Let us rather consider it in relation to the conditions which work up to joining battle. Opposing fleets are not going to rush forth upon the outbreak of war, merely bent upon meeting one another by the shortest cut and plunging into a grand clash. Elusiveness is the handmaiden of surprise and, although it grows more and more difficult in this era of aerial observation, yet it remains one of the attributes of tactical skill. Had two United States battleships left Devonport for the Falklands to try and head off von Spee's squadron, they would have arrived after he had done the mischief he designed and vanished. Sir Doveton Sturdee, with his three knots superiority over any American capital ship, was able to be there waiting for his enemy.

NOTES ON INTERNATIONAL AFFAIRS

From June 3 to July 3

Prepared by Professor Allan Westcott, U. S. Naval Academy

NAVAL REDUCTION PLANS

Discussions in London.—With the advent of Ramsay MacDonald's Labor Ministry, committed to a clearing up of relations with America, and the arrival of General Dawes as new United States ambassador at the Court of St. James, all conditions appeared favorable for a new attack on the problem of naval limitation. Immediately upon his arrival General Dawes with characteristic directness and energy paid a visit on Sunday, June 16, to Premier MacDonald, who was spending the week-end at Forres, in northern Scotland, where the two entered into a general discussion of methods of approaching the problem. Two days after this rather spectacular meeting, widely featured in the press, came Ambassador Dawes's speech on the subject before the Pilgrims Society in London. During the next week Ambassador Hugh Gibson, previous representative of the United States at the Geneva Conference and on the Arms Committee, came to London, and a series of informal discussions ensued between British and American officials, in which representatives of France, Italy, and Japan also took part. According to press reports two major points came up in these discussions: (1) whether the better procedure would be to have civilian officials meet first to determine the scope and character of the projected conference, or whether the naval experts should meet earlier to discuss technical details; (2) whether the proposed conference should be limited to cruisers, or to cruisers and battleships, or should consider all types. Special effort was made to avoid the appearance that the United States and Great Britain were arranging an agreement satisfactory to themselves, regardless of the other naval powers. It was made clear, however, that the United States, and probably England also, would insist on a conference limited to the five chief naval nations—the United States, Great Britain, Japan, France and Italy. At the close of June there was no very definite information as to progress made, General Dawes preferring that announcements should come from "those in chief authority," and every effort being made to clear the way diplomatically beforehand so as to avoid a second failure such as that at Geneva.

Ambassador Dawes on Methods.—The speech of Ambassador Dawes before the Pilgrims Society in London on June 18 was a presentation of his own views as to methods of reaching agreement on naval reductions, based on his experience as a financial expert. His argument was that just as in the settlement of international economic problems the work of financial experts had to be supplemented by the aid of statesmen who could "adjust the expert formula to the political conditions of their respective countries," so a naval agreement must be the work of both naval experts and practical statesmen. But General Dawes felt that by "the law of human nature" it would be "vastly more difficult for a mixed commission of navy technicians and statesmen to agree on a plan of naval disarmament than for a mixed commission of economists and statesmen to agree upon a reparations settlement . . . ."

"A naval expert is qualified to define accurately the principles which should de-

termine abstract naval equality, but the law of human nature decrees that his opinion is relatively not as safe in the program which he formulates as a practical interpretation of these principles applied to a partial destruction of his own navy. The proper pride of a naval officer's life is his navy. His whole professional career impels him to think of the navy only in terms of victory. He not only instinctively feels, but he is rightly taught the feeling that he must strive not for equal navies, but for a superior navy.

"It is difficult for him to forget that with a superior navy, victory is probable—with an equal navy, doubtful; with an inferior navy, almost hopeless. Other things being equal, I fear no naval officer ever inherently favors equality.

". . . . It would seem that to adjust to human nature the method of arriving at naval reduction each government might separately obtain from their respective naval experts their definition of a yardstick and then the inevitable compromise between these differing definitions, which will be expressed in the final fixation of the technical yardstick, should be made by a committee of statesmen of the nations, reinforced from the beginning by these expressions of abstract technical naval opinion and able again to seek further naval advice if necessary before final fixation.

"These statesmen should, further, be the ones to draw up for the world the terms of a final agreement upon naval reduction, which should be couched in those simple terms understandable by the ordinary man in the street, which, while the pet aversion of the casuist, are the highest expressions of true statesmanship. That final agreement covering quantitative dispositions will go to the nations for approval or rejection.

"If this should be the outcome, let those entrusted with the last draft of the conclusions of the last conference be men born with a faculty for clear, concise statement, for that document must appeal to the composite will of the peoples of the nations and in order to make a proper appeal must be read generally and understood."

BRITAIN URGED TO SCRAP WEST INDIES BASES.—Coincident with the revival of naval reduction discussions in London came a proposal, made by the political writer "Augur" in the July *Fortnightly Review* and also by another writer in the *Weekly Nation,* that England show her good faith in declaring that her naval policy was not directed toward a possible war with the United States by neutralizing her possessions in the Caribbean Sea. The *Fortnightly Review* article reads in part as follows:

"It occurs to us that Great Britain is in a fortunate position being able to render America a signal service and proving thereby at the same time in an irresistible manner the resolve of the government and the British people never to enter into fratricidal strife with the people on the other side of the Atlantic.

"The service we have in mind is the neutralization of the British possessions in the Caribbean Sea. The isthmus between North and South America is traversed by the Panama Canal, which tomorrow may be doubled by the no less magnificent waterway across Nicaragua. The life blood of the economic existence of the United States pulses through this opening between the two oceans.

"On the Atlantic side, clustered around the entrance of the inter-oceanic canal and across the route to it from the eastern seaboard are the British islands. Americans see in them potential bases for a hostile attack against the canal. The British people would feel the same way if America possessed a right on the Irish coast in the approaches to Liverpool.

"We give away no secret when we say that today the warlike equipment of the British colonies mentioned is negligible. It is the potentialities of the situation which exasperate the Americans. Now, if we apply to that part of the world the principle of perpetual peace so successfully existing on the Canadian border we discover the need for neutralization already mentioned.

"To have good effect the measure should be carried out on the following conditions: First, it should come as a free offer, and, second, no countervalue for it should be demanded. For if neutralization, or call it demilitarization, comes as a consequence of American suggestion, the moral advantage of the spontaneous action we recommend wil be lost. The same argument applies to the use of neutralization for bargaining. This is all the more so because the values

of the British islands and the fortifications at the entrance of the Panama Canal cannot be set off one against the other. This becomes clear if the magnitude of the American interests involved is taken into account."

The author believes British public opinion will react favorably to the suggestion, and he asks Premier MacDonald to take up the idea in his pursuit of better relations with the United States, which he says is a policy which Mr. Baldwin intended to carry out, and adds that Mr. Baldwin would have visited Washington this year if the Conservatives had remained in power.

REPARATIONS AGREEMENT

RATIFICATION OF DEBT PACT.—On June 21 the German Cabinet voted to accept the experts reparations plan as a basis for negotiations, on the condition that a complete liquidation of the various issues growing out of the war (meaning primarily the evacuation of the Rhineland) should be undertaken at the same time. Other nations were slower to take definite action on the Young plan, but it was hoped that a political conference could be held during the summer, ratification completed by October, and the International Bank put into operation before the end of the year.

At Washington on June 25 the American delegates at the Paris Conference conferred with President Hoover, Secretaries Stimson, and Mellon, and other officials. Both Mr. Young and Mr. Morgan emphasized the desirability of American representation on the directorate of the new Bank of International Settlement, but it was foreseen that many difficulties would lie in the way of such representation, even though the American representatives should have no direct governmental connection. It was also foreseen that a new agreement between the United States and Germany, involving Congressional approval, would be necessary to carry out certain changes made by the Young plan, so far as they affect payments from Germany to this country.

BANK OF INTERNATIONAL SETTLEMENT. —*Time* of June 17 gave a concise summary embodying additional facts that have come out regarding the Bank of International Settlement proposed by the Paris Conference to take over the handling of reparations payments, to finance and sell bonds of German railways and industries, and to pay the last twenty-one years of German reparations out of its profits.

The bank's original nominal capital will be 100 million dollars, its initial deposits some 300 millions. Voting stock will be divided among the seven countries participating in the bank: Belgium, France, Germany, Great Britain, Italy, Japan, the United States. Stock of the first six nations will be held by national banks of issue, United States stock will be bought and held privately.

The bank will be controlled by an administrative council, none of whom shall be active in politics. The Administrative Council will include one member from the national banks of each of the seven countries (exception, the United States), with additional members representing finance, commerce, industry.

Recognizing Washington squeamishness, it is provided that other members may appoint two members from any country unable to appoint its own.

Organizers of the bank are looking far beyond the 58½ years of German Reparations. It is their intention to make the bank an international clearing house for all international banking problems, eventually doing away with the necessity of shipping large quantities of gold from one country to another.

FRANCE SEEKS DEBT DELAY.—In the course of debate in the French Chamber at the close of June, Premier Poincaré declared his willingness to attempt negotiations with the United States for postponement until the end of the year of the $400,000,000 payment for war supplies, due on August 1 unless the Mellon-Bérenger agreement is ratified before that date. The aim of the postponement would be to delay ratification of the Mellon-Bérenger agreement until the fate of the Young plan should be definitely known. In a fiery speech preceding the Premier's declaration, M. Bouillon, leader of the new National Union group in the Chamber, declared that France could not be expected to commit herself to payment of her American debts until Germany and the allied nations had ratified the proposals of the Paris Confer-

ence, which would assure France the means to meet her American obligations.

A resolution permitting postponement of the French payments due August 1 was passed by Congress during the special session, but in the press of business this was not signed by the Speaker or the Vice-President before the recess. Hence when the request for delay was presented at Washington by the French ambassador, the administration did not feel warranted in granting the extension.

LEAGUE COUNCIL MEETING

Minorities Report Adopted.—The chief business of the Fifty-fourth Session of the League Council, held at Madrid during the second week in June, was consideration of a special committee's report on the question of League supervision of treatment of minority populations in various states of Europe. The report, which was adopted with only slight changes on June 13, gives the minority peoples better representation on the League Minority Committee and insures more careful consideration of their petitions. It rejects, however, the proposals made by Canada and Germany, which would have given the minority peoples the right of direct appeal to the Council. The Session adjourned in great harmony on June 13, after expressions of approval over the settlement of the Tacna-Arica dispute by Chile and Peru.

GREAT BRITAIN

Labor Cabinet.—Following the success of the Labor Party in England in the May elections and the resignation of the Baldwin Ministry, a new Labor Cabinet headed by Ramsey MacDonald took office on June 8. In the new Government Labor's financial expert Philip Snowden is Chancellor of the Exchequer, Arthur Henderson follows Sir Austen Chamberlain in charge of foreign affairs, Albert V. Alexander is First Lord of the Admiralty, and Sidney Webb Colonial Secretary. "Jim" Thomas, long prominent among Labor leaders, was made Lord Privy Seal, with the special task of dealing with the problem of unemployment. In attempting to solve the latter problem, it was expected that the government would adopt the Lloyd George plan of extensive public works, would modernize means of transportation, and would grant earlier pensions to workers in order to open positions for younger men. Minister Thomas planned also a visit to Canada to study the possibilities of emigration.

The new parliament met on June 25, and though Labor holds 288 seats, to 260 Conservative and 55 Liberal, the former Conservative speaker, Captain E. A. Fitzroy, was re-elected. The King's speech, delivered on July 2, stressed the government's intention to make definite progress toward naval reduction, improve relations with the United States, restore diplomatic intercourse with Russia, accept the Young reparations plan, and hasten evacuation of the Rhineland.

Renewed Relations With Soviets.—It was expected that the restoration of diplomatic relations with Soviet Russia would be one of the first proposals of the Labor Government to the new parliament, and would be put through with Liberal support. Negotiations will then presumably be reopened on the debt and claims question, with the MacDonald-Krassin agreement of 1924 as a basis for discussion. Friendly contact with the Soviet Republic will not be threatened by Leon Trotsky's recent request to visit England, which will be refused.

ITALY AND THE BALKINS

Vatican Accord Ratified.—Early in June the treaty between the Italian Government and the Holy See was ratified in an impressive ceremony at the Vatican. Premier Mussolini turned over to the papal treasury 750,000,000 lire ($39,225,000) and 1,000,000,000 lire ($52,000,000) in Italian government bonds. In its new position as an independent state the Vatican is evidently prepared to guard jealously its rights accorded by the agreement, for on June 5, just prior to the ratification, the Pope in an open letter took occasion to insist that the Concordat, regulating the status of the Church in Italy, must be considered as an integral part of the treaty, and that "any failure to observe the letter and the spirit of the concordat would render the treaty null and void." The letter also condemned as "heretical and worse than heretical" Premier Mussolini's statement in one of his recent speeches that the

Christian religion, born in Palestine, might have perished there but for its acceptance in Rome.

RADITCH ASSASSIN JUDGED.—Trial at Belgrad, Jugoslavia, of Deputy Punica Ratchitch for the shooting in parliament last summer of the Croatian leader Stefan Raditch and others, ended early in June with the sentence of Ratchitch to twenty years imprisonment. This outcome gave little satisfaction to the Croatians, who were further embittered during the same week by the arrest of seven of their chief leaders after participation in an anti-dictatorship demonstration at Zagreb, the Croatian capital.

UNITED STATES AND LATIN AMERICA

MEXICO SETTLES CHURCH PROBLEM.—Adjustment of the controversy between the government and the Catholic church in Mexico was announced in a statement issued by President Portes Gil on June 21. The settlement was the outcome of a series of conversations during June in which the church was represented by Archbishop Ruiz y Flores, the papal delegate, and Bishop Diaz, both of whom were native Mexicans. The terms of the settlement were embodied in President Portes Gil's statement, which gave a favorable interpretation to certain Mexican legal decrees putting into effect the sharp religious restrictions embodied in the Mexican Constitution of 1917. The President's interpretations were as follows:

First, that the provision of the law which requires the registration of ministers does not mean that the government can register those who have not been named by a hierarchical superior of the religious creed in question or in accordance with its regulations;

Second, with regard to religious instruction, the Constitution and laws in force definitely prohibit it in primary or higher schools whether public or private, but this does not prevent ministers of any religion from imparting its doctrines within the church confines to adults and their children, who may attend for that purpose;

Third, that the Constitution as well as the laws of the country guarantee to all residents of the republic the right of petition and therefore the members of any church may apply to the appropriate authorities for amendment, repeal or passage of any law.

The first concession, as given above, allayed the fear of the church that the recognition of priests and their assignment to duties would be taken over by the State. In a subsequent pastoral letter Archbishop Ruiz expressed the view that, since amendment of existing laws appeared not immediately possible, acceptance of the compromise seemed the best present solution, bringing about the resumption of church services throughout Mexico.

This settlement promises an end to the long struggle between Church and State which culminated in July, 1926, when President Calles issued a decree putting into effect the religious restrictions of the 1917 constitution. The decree restricted the clergy to native Mexicans, forbade religious instruction in schools, prohibited monastic orders, and put all church property under state control. Thereafter the Mexican clergy, acting with approval from Rome, suspended religious services throughout the country. The intense feeling aroused led to revolutionary disturbances which have continued in parts of Mexico since the enactment of the restrictive decree.

Much credit for the solution of the problem is given to Ambassador Morrow, who was instrumental in bringing representatives of the two sides together, and also to Father Edmund A. Walsh, vice-president of Georgetown University, and Signor Tocornal, former Chilean ambassador at Washington, both of whom took part in the negotiations. The church issue has been thought perhaps the most important facing Mexico in recent years.

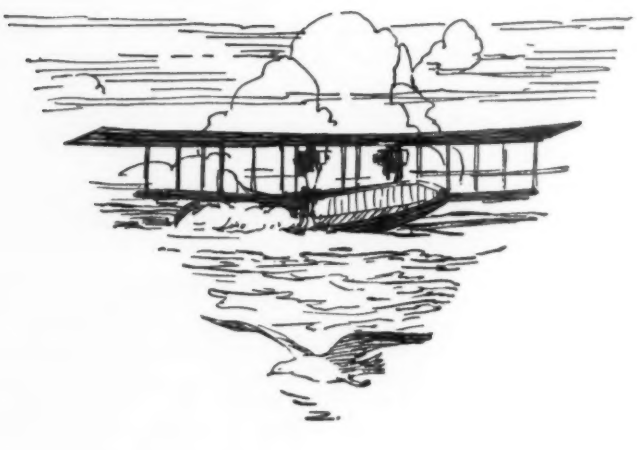
RUM RUNNING CLASHES.—The campaign of United States officials against liquor smuggling, especially in the Detroit area along the Canadian frontier, again took on an international aspect when on June 19 it was reported that a rum-running craft had fired upon an American customs patrol vessel, retreated into Canadian waters, and then continued firing. While the U. S. State Department was undertaking an investigation of this affair, the Canadian police were concerned with injuries to a Canadian pleasure craft in the same area,

alleged to have been caused by machine-gun bullets fired by an American patrol.

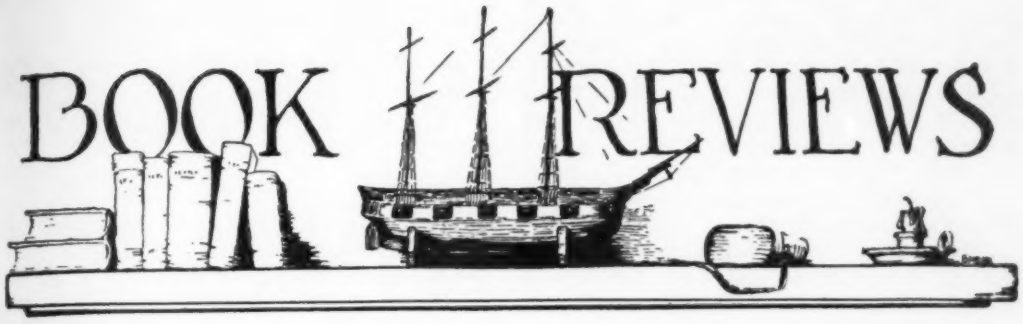
FAR EAST

Nanking Gains Strength.—At the close of June it became clear that the menace of war against the Nationalist Government in China on the part of Marshal Feng Yu-hsiang was ended, the Nanking leaders having mustered sufficient strength in Northern China to prevent Feng from hostilities. In an interview at Peking on June 27 President Chiang Kai-shek declared that "the day of the old-style militarists is ended. This year there have been abortive attempts at revolt against the central government at Hankow and Canton, but both, though strong in a military sense, have crumbled before the idea of unification rather than before military attacks." Chiang said that Feng would go abroad within a week, and would act as "special investigation commissioner to report on foreign economic affairs." Feng was said to have insisted on a large sum of money for payment of arrears to his troops, but finally accepted $3,000,000 for this purpose, plus $200,000 for traveling expenses. Meantime President Chiang at Peking was seeking interviews with Feng and other northern leaders.

Japan Ratifies Kellogg Peace Pact.—On June 26 the Japanese Privy Council voted to ratify the Kellogg Peace Treaty, with a brief explanatory interpretation of the phrase of the treaty "in the name of their respective peoples," which to many in Japan appeared incompatible with the fact that the treaty making power is vested solely in the Emperor. The action of Japan completed ratification by the fifteen original signatories of the treaty. Of the forty-nine other nations invited to become parties, all but Argentina and Brazil have either ratified or signified their intention to do so.



BOOK REVIEWS



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ON THE BOTTOM. By Commander Edward Ellsberg, U. S. Naval Reserve. New York: Dodd, Mead and Company, 1929. $3.00

REVIEWED BY LIEUTENANT NEIL B. MUSSER (DE-F), U. S. NAVAL RESERVE

Marine salvage operations have a powerful appeal to civilians and naval officers alike. The fascination of hand-to-hand struggle with the sea personified, as described by Victor Hugo in *Toilers of the Sea,* has drawn humankind of all times to tales of arduous and dangerous adventures. In *On the Bottom,* Commander Ellsberg has given us an epic of the sea, to stand with Hugo's masterpiece and illustrate the fact that although methods and equipment change, the struggle with the elements and the forces of nature will always tax the strength and fortitude of man to the utmost. This account of the difficulties encountered in lifting a thousand-ton burden from the bottom of a cold and stormy sea holds much of professional value for both engineers and mariners.

Marine salvage work is an acid test which few engineers can stand without revealing weak links in their chain of education and training. The salvage engineer must be well grounded in all branches of science, and must be able to draw from every field of engineering for assistance in some phases of his work. There is no time for long-winded conferences, or for making polished drawings or checking and rechecking computations. Here the struggle with the sea and the use of the available media must be directed by one person, who must be capable of making accurate decisions rapidly. The Navy is fortunate to have had a commander for this difficult enterprise of whom the higher command could say at the end of the operations: "His ingenuity was inexhaustible, his perseverance in the face of constant setbacks was unfailing, and his determination animated and inspired all hands."

On the Bottom is a handbook in seamanship which every line officer would do well to read and digest. During those strenuous months there was little in the gamut of handling ships, lines, and anchors that was not practiced under conditions of the greatest stress.

In times of great peril, technical knowledge and skill in making rapid designs and in arriving at correct engineering decisions is of no more importance than the ability to arouse feelings of loyalty in subordinates, and to inspire them to perform tasks which they could well avoid. Above all things *On the Bottom* stands out as a text on morale, and it is primarily as such that I would recommend it for the earnest study of every naval officer.

The achievement of raising the *S-51* was unique in many ways. The deepest diving ever accomplished where the divers survived and were able to descend day after day and remain for hours on the bottom doing strenuous manual labor, was undertaken on this job. The state of the surface sea was so bad during part of the diving operations, that experienced commercial divers would have refused to descend. The *S-51* was raised primarily by the divers, and this

would have been impossible without a commander who possessed an intimate knowledge of all data concerning the physical effects of diving and the technique of decompression, as well as a decompression chamber and a capable surgeon who had specialized in the treatment of "bends" and oxygen poisoning. The dangers and difficulties of diving could not have been better illustrated than by the description of Tom Eadie's narrow escapes in rapid succession from death in four different forms—the "bends," being crushed under the *Falcon*, a "squeeze," and drowning.

Although in one sense the *S-51* wrecking crew was assisted by all the data obtained during past salvage operations, both commercial and naval, it is doubly to the Navy's credit that this accumulated experience was in a readily available form when the emergency arise, and in the hands of one engineer who was given the sole authority over the operations and responsibility for the success of the engineering features of the work. In spite of all that was known about diving when the *S-51* operations started, the methods used at the beginning were crude compared to those employed during the last stages of the work. In Commander Ellsberg the divers had a leader who understood the terrible physical handicaps of work in the dark, cold water at the bottom of the sea, the physiological complications which are liable to develop, and the temporary loss of mental balance or good judgment by young and inexperienced divers when confronted by the above conditions.

Commander Ellsberg not only learned to dive, but he went to the bottom time after time and accomplished useful work which relieved the other divers when they were the most harassed. He chose tasks which were difficult, and on which the success of the expedition depended. By so doing he risked the bad influence on the morale of the crew which would have resulted from his failure, or the wreck of the entire job which would probably have followed had an accident befallen the leader. In a truly desperate situation he rightly staked all for the success which followed. Two outstanding acts of personal heroism which must have had a salutary influence on the crew were his descent with his new torch to cut off the stub mast when rising seas made diving extremely hazardous, and his struggle on the sinking pontoon which saved the *S-51* from a second sinking and extended salvaging in the East River.

No better example could be given of the personal influence which Commander Ellsberg exerted over his men than the account of Wilson risking his life to close the forward door of the control room, ascribing his act to the desire to reward his commander for a night's liberty in Newport. The author never exaggerates the difficulties encountered, which have been described at length by others who witnessed the undertaking. On the contrary, his constant exposure to the will of the sea made him accept conditions as casual, or at the most uncomfortable, which a beginner at the deep-water and open-seaway salvage game would have considered insurmountable.

The evil effects which are sure to follow from indiscreet remarks made by officers to the crew are well illustrated by the demoralization of the divers after the failure of June 22. After the offender was detached, it was easy to bolster up the morale of the crew and convince them that the setbacks were not serious enough to mean defeat.

The importance of providing ample safety margins in designing all equipment used in salvage operations is well illustrated by the experiences on the *S-51* job, where the vessel was finally raised without utilizing the buoyancy of the control room which had been included in the available buoyancy calculations right up to the time of raising the vessel. This compartment sprang a bad leak from an unknown cause after further diving operations had become impracticable. Later, while towing the wreck to drydock, the success of the expedition hung on the strength of the single wire rope which had been designed for steadying the stern, and not for towing the full weight of the pontoons and suspended vessel.

The job was delayed for weeks because of a piece of pipe which a careless workman had left in one of the submarine's ventilation ducts while the vessel was being built. The story points out the undesirability of using any complicated or heavy apparatus in raising sunken vessels. The diver's freedom of motion, the extent of his vision, and the force he can exert are very small. Anything to be done by the divers must be simple and easy, and should be rehearsed if possible on a vessel of the same type as the

wreck. Frazer's overstrain on the gun-access hatch cover and his loss as a diver illustrates this principle.

Few naval officers can feel, like one in civil life, how great an interest was taken in the *S-51* job by civilians. While the job was underway, through the courtesy of Commander Ellsberg, I received copies of the daily bulletins which he made up on the job for the information of his superiors. I was then in the Philippines, and we of Cavite followed the progress of the work with avidity. We shared its disappointments and gloried in its achievements, thinking all the time that the *S-51* tragedy was being enacted in the service by naval personnel without much notice from the nation. The complete official report which quickly followed the successful raising of the *S-51* was shared by me with many brother officers, as an epic which was brimful of human interest, heroism, and engineering achievement that would never be known or appreciated by the public. But then there followed a series of popular and technical articles by Commander Ellsberg, Captain King, and others, which appeared about the time I was starting my new work in civil life, and were read and discussed with great interest by the civilians with whom I was working. As an ex-naval officer, I was plied with questions, and since this subject was of the greatest personal interest to me, I lost no opportunity to discuss the various features of the work which astonished the readers or the accomplishments which appeared almost incredulous. Now the Literary Guild has chosen *On the Bottom* as its best book of the month for May, and again the Navy's struggles, disappointments, and finally its complete success in raising the *S-51* are a subject of popular interest.

Not only were many of the engineering features of the *S-51* job unique, but the accomplishments of Commander Ellsberg in describing them in such a charming and non-technical style will rank as one of the most difficult feats ever achieved by a naval officer. The few gentlemen of the military profession who have literary talents are of the greatest benefit to the services which they interpret to the people. *On the Bottom* will do more toward making the public know and understand and approve of the Navy than did the actual raising of the *S-51*.

One fact not mentioned in the book which is of the greatest interest is that the methods and equipment developed on the *S-51* job have since been used with little modification in salvaging a similar wreck, the *S-4*, and later in raising a submarine which had been sunk on purpose as an experiment to test the standard methods of raising submarines which had been developed by Commander Ellsberg on the preceding two jobs. These standard methods worked out satisfactorily under actual service conditions, and it is certain that great savings in time and cost will result from the use of these methods in case necessity arises. Of course conditions such as the manner of sinking and the depth of water and state of wind and sea will remain variables which may baffle future attempts at salvage, and the rescue of men from sunken submarines is not being left to the necessarily slow and uncertain salvage operations. Personnel rescuing devices such as the "lung" of Lieutenant Momsen have been developed to supplement the major equipment and methods which are being made ready for any emergencies.

In addition to the strictly naval benefits resulting from his experiences on the *S-51*, Commander Ellsberg has developed methods and equipment which can be used to advantage by commercial organizations in marine salvage work and various other industrial undertakings. His underwater cutting torch is an example; two others are the use of the balanced and self-scavenging nozzle for tunneling under sunken wrecks, and the methods of placing quick-setting "lumnite" cement patches or plugs underwater. He proved the impracticability of the use of floating derricks for salvage operations in an open seaway, and improved the design of the underwater lamp.

Throughout his book Commander Ellsberg uses the medium of suspense to grip the reader's attention. Smith's courage in digging his way out from a caved-in tunnel under the boat, and then reëntering to continue the work; Badder's "Aye, aye, sir!", and his bravery on the pontoons; Wickwire's heroism in climbing on a pontoon in a seaway to operate the valves; Tom Eadie's caulking job on the vessel's hull; Wilson's and Eadie's two and one-half hour dive when they completed the first tunnel under the boat; and Smith's and Carr's three and one-half hour dive trying to secure the engine-room hatch, all illustrate this side of his book.

The removal of the body of Lieutenant Haselton from the gun access hatch aroused in me particularly poignant emotions. Poor Haselton was my classmate; we finished our course as close neighbors at the Academy, and were in the same company. His loss brought home to me something of the feeling of the families who had lost their loved ones on that dark night in September, 1925.

It is strange that every mariner who has pitted his best efforts in a struggle with the forces of the deep, instinctively comes to regard the ocean as a malevolent diety set upon the destruction of man. We would expect this effect in the works of an imaginative writer, but when we see it in the work of a practical engineer and leader of men we realize the strength of the sea and the fascination of its challenge. In numerous places the reader will be delighted with passages which are poetic, and laden with human significance. "Cold spray, a biting wind, the tumbling seas; the dismal note of the wreck buoy coming to us, monotonously droning a requiem for those below; an occasional glimpse of the mooring buoys as the waves heaved them above the surface; our storm-tossed ships fighting the gale."—"'There isn't one of that bunch of divers, Mr. Ellsberg, who wouldn't go to hell for you!'"

The concluding chapter is very brief, but it carries the whole story in epitome. "It is over. The task is done, the divers have dispersed, the *S-51* is a memory. But to the families of the men who formed her crew, we have brought back the bodies of their loved ones, heroically dead at their posts on the *S-51*. To the Navy, we brought back its ship. And to the Nation, we brought back a story of victory over the sea, wrought by the quiet courage of men who could face death in solitude, disregard failure, and still fight on till they had wrested from the ocean the tomb of their shipmates."

FALSEHOOD IN WAR TIME. By Arthur Ponsonby. New York: E. P. Dutton and Company, 1929. $2.00.

Reviewed by Lieutenant Commander J. M. Creighton, U. S. Navy

If you wish to have your eyes opened to some of the innermost operations of the "Movements Behind the Screen" in the Great War, you should read this book. You must be prepared, however, to do so at the price of some personal indignation at the degree to which your innocence and generosity have been imposed upon in the past, and with an assurance that you may have some increase in your impulse toward cynicism in the future.

The author is a member of the Parliament of Great Britain. The purpose of the book is to examine, in detail, the principal stories which were circulated by the official propaganda agencies of the various countries engaged in the Great War; their sources, means of dissemination, and the evident fact that they were lies; and that the government agencies responsible for their distribution knew that they were lies, or were probably so, at the time of their creation.

The manuscript is largely concerned with the stories of illegal means of warfare and frightful conduct on the part of the Germans, and it is particularly interesting to Americans because we were, outside of Europe, the chief recipients of these fabrications. Official documents, the records of official investigating committees, and the reproduction of questions and answers publicly uttered in the House of Commons are the means taken by Mr. Ponsonby to confound the authors of the most famous falsehoods with which we were deluged in the United States.

Take the most notorious of these stories, in the order of their appearance:

(1) The British promises to coöperate with France in case of war between France and Germany. To quote: "Our prompt entry into the European War in 1914 was necessitated by our commitment to France. This commitment was not known to the people; it was not known to the Parliament; it was not even known to all the members of the Cabinet. More than this, its existence was denied." The author goes on to show that there were such agreements and understandings completed between the British and French officials, beginning as far back as 1906, and fortified and renewed thereafter, that it was outside the power of the British honorably to abstain from helping the French when the war broke out. The fact that such commitments and agreements existed was repeatedly and publicly denied by the highest British officials before and during the war.

(2) Poor, innocent Serbia, and the out-

rageous severity of the Austrian demands upon her after the assassination of the Austrian Archduke in Bosnia.

In 1924 Ljuba Jovanovitch, the President of the Serbian Parliament, who had been Minister of Education in the Serbian Cabinet at the time of the assassination, published an article from which it is apparent that:

(a) The whole Serbian Cabinet knew of the plot to murder the Archduke some three weeks before it happened;

(b) The Serbian Prime Minister and the Minister of the Interior (in charge of the police and civic order) knew which society of men had planned to do it;

(c) Orders were issued to the "Frontier Guards" to prevent the members of the society who were to commit the murder from passing into the area where the Archduke was to be, but that many of the guards were also in the society and let the intended assassins go through.

The Serbian Prime Minister (Mr. Pashitch) later stated: "Had we known of the plot against the late Archduke Franz Ferdinand, assuredly we should have informed the Austrian Government." Yet he did know of the plot, and he did not warn the Austrian government of it. The plot was hatched and executed by a revolutionary society called "The Black Hand" at the head of which was Dimitrijevitch, the chief of the Serbian Intelligence Staff. Dimitrijevitch was executed in Salonika in 1917, evidently because his intimate knowledge had made it inconvenient that he should remain alive.

The foregoing are samples of the treatment of other subjects in this exposé. They include: "Invasion of Belgium as the Cause of the War"; "The Mutilated Nurse"; "The Crucified Canadian"; "The Corpse Factory" (in which it was stated that the Germans boiled down dead soldiers to get the fat out of them); "The German U-Boat Outrage"; "The *Lusitania*"; "Atrocity Stories"; "Belgian Babies' Hands"; "Outraged Nuns"; etc., etc.

Mr. Ponsonby does not present to you only the lies, deceptions and evasions practiced by the British, but gives you a few examples of the art as practiced by the French, Italians, and the Germans themselves. As the Allies held most of the means of communications to America, it was from them that we received the chief stream of falsehood which inundated the country, and without which, it is generally considered, the people of the United States, as ignorant and disinterested as they were of matters in Europe, could never have been brought into the conflict.

BRASSEY'S NAVAL AND SHIPPING ANNUAL—1929. Edited by Commander C. N. Robinson, R.N. London: Willian Clowes and Sons, Limited. 25 shillings.

REVIEWED BY BROCKHOLST LIVINGSTON

One thing impressed me in reading this volume. It was that Americans should be dependent on such biased and inaccurate sources for their information concerning maritime affairs. Surely from our nation we can find suitable material for an improved type of naval and shipping annual. No one should accept without question the facts and figures found in *Brassey's*, for I was amazed that even when I felt the statement might be true, some typographical error had often been made which detracted from its weight.

One must, however, be lenient with the editors, since they have worked against such odds in this year's edition, Sir Alexander Richardson's death having imposed a heavy responsibility on the new directors. It is, consequently, gratifying that even against these handicaps, there is much that is brought up to date and is a distinct advance over previous volumes.

Throughout the book there is a decided bias against all that is American, the sole defense of our actions being made by Rear Admiral W. L. Rodgers, who has written on the naval policy of the United States. Set down in the midst of such criticism of our ways, his essay is a decided relief. In this respect, I shall be pardoned if I quote at rather great length from a chapter on "Foreign Navies" by Captain E. Altham, R.N. He writes:

> It is a little difficult for a comparatively self-supporting country like the United States with very limited extraterritorial responsibilities, to argue logically the necessity for an increase of naval forces at a time when most of the world is bent on easing the burden of armaments. The only reason which might fairly be advanced would be a growing mercantile marine. In fact, the American merchant fleet has steadily diminished during recent years. Not unnaturally, therefore, in com-

pany with the call for an expansion of the fighting navy, there has been a demand for further Government assistance to develop commercial shipping flying the American flag. National pride may demand that American goods be carried in American ships, but in a country where the cost of shipbuilding and standard of seamen's wages is so high, a Government subsidy is indispensable if this position is to be attained. It remains to be seen whether the American people will foot the bill.

How surprised every Englishman would be if we did regain our once enviable position on the seas—and without the government subsidy the captain seems to believe so indispensable!

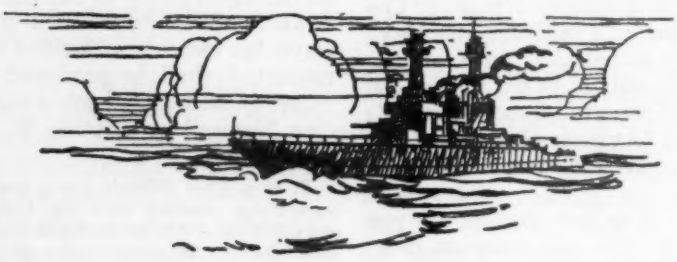
Among the more interesting (and, from a naval standpoint, timelier) articles, we may include that by Commander Niimi of the Japanese Navy, on "Historical Observations on Japan's Naval Policy"; a broadminded treatise on "Post-War Developments in Naval Machinery," by any anonymous writer who aptly styles himself "S.H.P."; and a general paper on "The Submarine Mine" by Commander Gwynne of the British Navy. Were the editors to confine themselves to such generally constructive articles, I believe *Brassey's* would be a more valuable and less antagonistic volume.

In "Contemporary Naval Literature," one notes a glaring lack of American writers and regrets that the author is so unaware of American navalists as to omit them or, if there be none worthy of comparison with Bywater, Ballard, Custance, or Hurd, that this is the case.

The merchant marine section comprises much helpful information of a less radical nature and is better prepared, although there appears to be much repetition of figures by the various authors. An informative article by Alfred H. Haag on "The American Merchant Marine," impresses the belief Americans could produce their own maritime annual, while a chapter on "Notable Merchant Ships of the Year" is conspicuous in its lack of mention of any such ship of the American merchant fleet. Certainly the *Virginia* might be so classed. But then it is *Brassey's* which is setting forth all this, and *Brassey's* is apparently not favorable to American productions.

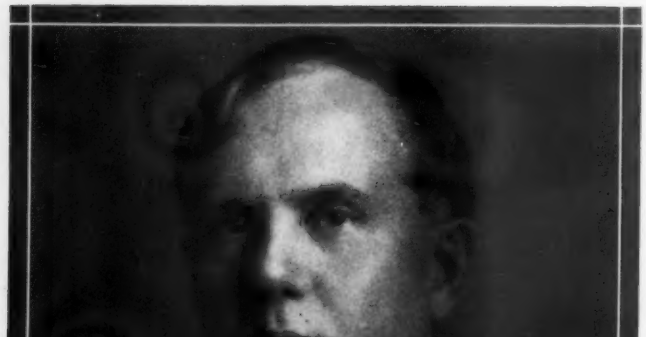
It is characteristic of the book that no profile is shown of any American warship but the battleships and destroyers. The 7,500-ton cruisers are ignored as are the carriers and, while practically all the French ships, no matter of what age, are shown, even our old cruisers do not appear in the silhouettes. The *Omaha* class is, however, shown in the plans.

Brassey's has always seemed to me to be a species of stepchild in naval literature. *Jane's* fills an especial need but this volume does not seem to fit. The articles on naval affairs are of the sort which might well make up a "Review Number" of the PROCEEDINGS, while the merchant marine treatises are surely handled in regular maritime periodicals. The silhouettes and plans are not complete enough to be accepted as correct and the tables are dangerously inaccurate. One thing is in its favor. It is cheaper than *Jane's* and would probably be equally helpful to a merchant ship.



ANACOSTIA ANNUAL SEAPLANE RACE TROPHY

Secretary of the Navy Charles F. Adams, left, congratulating Lieutenant W. C. Tomlinson, U. S. Navy, on winning the Curtiss Trophy in the annual Anacostia Seaplane Speed Races. Tomlinson made the 100 miles in unofficial time of 37 minutes. Trophy is shown in center. May 26, 1929.



Distinguished Naval Academy Graduate in Civil Life

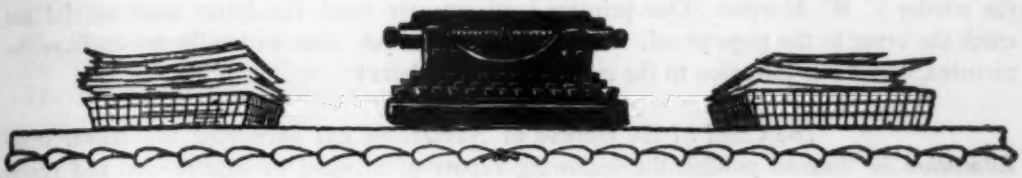
George W. Littlehales

SON of William Henry and Margaret (Reber) Littlehales; born near Pottsville, Pennsylvania, 1860; graduated from the Naval Academy in 1883; served in the Naval Brigade of the North Atlantic Squadron in the campaign to open transit across the Isthmus of Panama in 1885; appointed in the United States Hydrographic Office in 1885. As Chief of the Division of Chart Construction, he developed the means for equipping American vessels with charts and information respecting the coasts and waters to which their voyages might be directed. During his forty-three years' service in the Hydrographic Office, he has conducted many researches in geophysics, including hydrography, oceanography, and terrestrial magnetism. He has contributed extensively to the scientific press, has edited the mathematical tables for the use of American seamen, and is the author of standard works issued by the government for navigators.

Served as consulting hydrographic engineer to the Carnegie Institution of Washington during the design and construction of the non-magnetic yacht *Carnegie* and initiation of magnetic surveys on the ocean; professor of Nautical Science in the faculty of the George Washington University, 1912 to 1927; among the founders and sometime associate editor of the *International Journal of Terrestrial Magnetism and Atmospheric Electricity;* past president of the Philosophical Society; past vice-president of the Washington Academy of Sciences; member of the Division of Foreign Relations of the National Research Council; vice-president of the Commission of the International Section of Oceanography of the International Research Council.

Delegate of the United States to the Brussels Congress, 1919, for the establishment of the International Research Council; to the International Hydrographic Conference, London, 1919, leading to the establishment of the International Hydrographic Bureau at Monaco; to the First Pan-Pacific Science Congress, Honolulu, 1920; to the Congress of the International Geophysical Union of the International Research Council, Rome, 1922; to the Pan-Pacific Science Congress, Tokyo, 1926.

SECRETARY'S NOTES



Roaring on

Another year of aviation history has been written. Records of last year are ancient history; seaplanes and land planes have been driven to greater heights than ever, and by a naval aviator; the continent has been crossed from coast to coast and back again in a day and a half; a balloon has made a flight of eight hundred miles, again a naval aviator; and planes have stayed in the air for six days, for seven days and, as this is being written, one is entering its eleventh day of continuous flight.

What are we coming to? No one knows. Transcontinental rail-airways are now in operation and the public is taking to this new means of fast long-distance travel. With airports being established throughout the country, with air mail being delivered to most of the larger cities, with transoceanic flights being accepted as commonplace, we are in a fair way to becoming air-minded.

The last year has demonstrated that the airplane engine is capable of flying a plane from eighteen to twenty thousand miles. Pilots have shown themselves able to fly a plane for days and days. It remains for designers to make a plane that can carry gas and oil in sufficient quantity to match the engines and pilots.

There is no use being pessimistic about it; someone will startle the world some day with a design that will permit much greater loads to be carried, just as the last year has seen engine and pilot dependability demonstrated far beyond the most optimistic dreams.

Aside from the economic effect of fast communication, the airplane is having a political effect. Europe is now seriously considering a union of the states of continental Europe. This is bound to come, for the new situation brought about by the airplane makes it possible for a nation so inclined to annihilate a neighboring state overnight; or at least, to reduce its important cities and thereby bring about demoralization. All that will be necessary is to forget to formally declare war for a few hours.

We may expect, in time to come, new political line-ups, with the seas as the frontier. Airplanes can attack quickly and land forces can follow up the attack in time to reap its benefits, as long as the sea does not intervene. Therefore, nations not separated by the seas will have to band together, except possibly such vast countries as Russia and China, where the broad expanse of territory is equally as effective as the sea in preventing the rapid advance of troops to take important centers.

The fates have been kind to the United States, for we find ourselves protected by thousands of miles of oceans. Troops must be moved over these thousands of miles of oceans in order to do us ultimate damage. With a strong Navy, we can prevent the transport of troops until such time as this normally peaceful country can mobilize its forces.

Another Mistake

It would seem as if the Naval Institute could not make a mistake about that gallant old ship, the *Constitution!* But we did. In the July issue we published a plate of a silver model of the *Constitution,* at least we said that in the legend. As a matter of fact, we had two plates, one of the *Constitution* and one of the whaler *C. W. Morgan.* Our printers inadvertently used the latter and we did not catch the error in the page proof. Mr. Frederick R. Fish, who so kindly let us have the pictures, called our attention to the mistake, as did others!

Education in the Navy

The Chief of the Bureau of Navigation has permitted the Naval Institute to publish the following report of a board to inquire into and report upon the curriculum of the General Line Course at the Postgraduate School and the courses at the Naval War College. It is felt that this report will be of value to the service and of interest to friends of the service. The report follows:

1. .....

2. The convening order required the board:

(a) To inquire into and report upon the curricula of the General Line Course at the Postgraduate School and the courses at the Naval War College with a view to eliminating duplication and to coördinate the work of the General Line Course with the War College courses.

(b) To make a thorough investigation of these courses and make recommendations as to the curricula of the General Line Course and War College courses with a view to making progressive the general education of the officers of the line of the Navy.

(c) To make any recommendations considered advisable relative to the education and training in general of line officers of the Navy.

3. The Board held its first formal meeting at the Naval War College, Newport, Rhode Island, on April 17, 1928. A preliminary study of the subjects to be reported on was made at that time, and the procedure for further carrying out of the instructions laid down in the precept was agreed to as follows:

(a) Individual members of the board to make thorough investigations of the various items required for consideration and, as far as practicable, to interchange views, express opinions, and adjust differences that might arise, by correspondence.

(b) To hold such formal meetings from time to time as the conditions might warrant.

4. The procedure outlined has been followed, there having been additional formal meetings of the board at the Postgraduate School at Annapolis, on October 25, 1928, and at the Navy Department, Washington, on February 19, 1929, when the final draft of the following report was agreed on.

THE CURRICULA OF THE GENERAL LINE COURSE AND THE WAR COLLEGE COURSES

5. .....

6. Prior to reporting on these curricula, the board considers it essential to set forth the fact that the Bureau of Navigation directed the establishment of the General Line School and the Junior War College in accordance with the recommendations made by a board of officers composed of Captain D. W. Knox, U. S. Navy, Commander E. J. King, U. S. Navy, and Comander W. S. Pye, U. S. Navy, which board made a study of all matters pertaining to the education of line officers of the Navy. The report and recommendations of that board were approved by the Bureau of Navigation in 1919.

7. The present board, after a thorough study of the Knox-King-Pye board report, considers that the study of the subject as then made was thorough and complete and the recommendations basically sound.

8. The Knox-King-Pye board reported that:

Four periods of instruction (training) are found necessary, to be so distributed through the naval officer's career as to make it the general rule that an instruction and training period precedes the employment in an advanced phase of usefulness.

The four instruction and training periods are:

I. The Naval Academy.
II. The General Line Course.
III. The Junior War College Course.
IV. The Senior War College Course.

So that as

(a) The Naval Academy (initial instruction period) prepares for the earliest and lowest phase—inferior or subordinate, so will

(b) The General Line Course (second instruction period) prepare for the second phase—superior subordinate—and

(c) The Junior War College Course (third instruction period) prepare for the third phase—commanding officer—and

(d) The Senior War College Course (fourth instruction period) prepare for the fourth and highest phase—flag officer.

The length of time and the point in the service at which the instruction (training) periods should take place are found to be:

(a) Naval Academy—four years—preliminary and preparatory to commission, in readiness for first phase of usefulness—inferior subordinate.

(b) General Line Course—one year—between five and ten years commissioning (preferably after five years, general service) in readiness for second phase of usefulness—superior subordinate.

(c) Junior War College—one year—between tenth and twentieth year of commissioned service (preferably while in the grade of lieutenant commander) in readiness for third phase of usefulness—commanding officer.

(d) Senior War College Course—one year—after twentieth year of commissioned service (preferably while in the grade of captain) in readiness for final phase of career—flag officer.

9. The board finds that the curricula of the General Line Course, the Junior War College Course, and the Senior War College Course have been framed with a view to assisting in the preparation of officers for the various phases of their careers as set forth in the foregoing quotations from the Knox-King-Pye board report; and that the curricula of these three courses do actually meet these requirements and are specifically framed with the following in view:

For the General Line School: The chief purpose of the instruction is the unification, confirmation and extension of previous instruction and experience of officers. The course should materially assist in preparing them for the duties of heads of departments and for command of small vessels.

For the War College: The chief purpose of the instruction is to assist in the preparation of officers for command duties in time of war and for duties on the staff of flag officers afloat.

10. The board finds that there has been and still is some duplication in the curricula of the Senior War College, Junior War College, and General Line Courses. The duplication which exists in the curricula of the Junior War College Course and the Senior War College Course is due to the following: There being no eligibility rules, other than rank, for officers who attend the Senior War College Course, the large majority of them have not the necessary fundamental background for solving complex problems which are required in the training for high command. It is therefore necessary to have embraced in the curriculum of the Senior War College Course some of this more or less elementary work which rightfully belongs in the curriculum of the Junior War College Course. The board is of the opinion that this duplication will continue until practically all officers who attend the Senior War

College Course will previously have graduated from the Junior War College. The board recommends that changes in the curricula for the elimination of the duplication in the two War College courses, which may become advisable owing to changing conditions, should be left to the discretion of the president of the Naval War College. The small amount of duplication in the General Line Course and the Junior War College Course that existed at the time of first meeting of this board, has now been eliminated owing to the investigations made by the board.

THE ASSIGNMENT OF STUDENT OFFICERS

11. The board finds that the assignment of officers to take the various courses has not been entirely in accordance with the recommendations of the Knox-King-Pye board. The variations to those recommendations in this respect are as follows:

The General Line School: Officers with more than ten years' commissioned service have been assigned to take this course.

The Junior War College: Officers with less than ten years' commissioned service have been assigned to take this course. In some classes the greater number of student officers have been of the rank of lieutenant instead of lieutenant commander.

The Senior War College: The greater number of student officers assigned to take this course are in the grade of commander instead of captain.

12. Careful consideration of these variations in assignments of officers from the approved Knox-King-Pye board recommendations shows that some of them are due to service conditions which cannot be ignored. For example:

(a) In view of the large number of captains who have had the Senior War College Course, it is now necessary to detail many commanders to take this course, in order that the classes may be filled, and in order that all officers of the grades of captain and commander may have the opportunity to take this course. However, as all commanders in the future will have completed twenty years' commissioned service, all officers taking the Senior War College Course will be in accordance with the basic recommendation.

(b) While the Junior War College Course is for officers between the tenth and twentieth years of commissioned service and primarily for lieutenant commanders, consideration must be given to the probability that in the near future all lieutenant commanders will be between the fourteenth and twenty-first year of commissioned service. Therefore, many senior lieutenants will have completed ten years of commissioned service. The board is of the opinion that such senior lieutenants, provided they have completed two sea cruises, should continue to be eligible for the Junior War College Course. However, the board appreciates that the present personnel situation as regards the assignment of lieutenants and lieutenant commanders necessitates the detail of a certain proportion of the seniors of General Line Course graduates to the Junior War College Course to meet the exigencies of the service.

(c) The board is of the opinion that as far as practicable officers assigned to the General Line Course should be those completing their first cruise as commissioned officers; and, is further of the opinion that when there are more officers of more than ten years' commissioned service available for assignment to the Junior War College Course than the college can accommodate, the eligible juniors be available for assignment to the General Line Course.

PROGRESSIVE INSTRUCTION

13. The report of the Knox-King-Pye board states:

Inasmuch as it is obviously impracticable and impossible to equip the officer for the whole period of his service during his initial instruction (Naval Academy) it becomes necessary to arrange and to provide for his further instruction and training at recurring periods.

Successive periods of instruction and training occurring at intervals between periods of practical

experience is the best means to develop judgment which, in positions of great responsibility, is an attribute which is hardly of inferior importance to the ability to reason to a logical conclusion.

The board considers recurring instruction periods as indispensable to efficiency.

14. The board is of the opinion that these statements of the Knox-King-Pye board with respect to the necessity for instruction at *recurring periods and at intervals between periods of practical experience* are sound, and it is therefore recommended that insofar as the exigencies of the service permit, the practice of having some officers take the General Line Course and the Junior War College Course in successive years be discontinued. The board appreciates, however, that as previously stated herein it will be necessary to continue the present practice for some years.

15. The board finds that while, with the exception above noted (officers assigned to General Line School and Junior College in successive years), the periods of instruction are recurring and occur at intervals between practical experience, there are some officers, especially junior commanders, who, after completing the Senior War College Course, will have a long period of service (in some cases fourteen years) prior to reaching flag rank. There are other officers now in the grades of captain and commander who completed the Senior War College Course prior to the Great War and, in consequence, have not had the advantages of the advancement made in the War College since that time. The board is of the opinion that it would be of great benefit to the officers specified and, therefore to the service, if an opportunity were given them to have another year's instruction at the War College. It is therefore recommended, in order that the cycle of progressive instruction be completed, that the provision in the Navy Department General Order No. 168, of September 21, 1927, which provides for the establishment of the Naval War College Advanced Course, be carried into effect immediately. Eligibility of officers who may take this Advanced Course is specified in General Order No. 168 as "Flag officers and senior captains who have completed the Senior Course." It is further recommended that the senior captains detailed to take the Advanced War College Course be selected with a view to their probable future usefulness to the service.

The War College Correspondence Courses

16. Navy Department General Order No. 168 states the purpose and scope of the War College Correspondence Course in Strategy and Tactics. As there are other correspondence courses which are not mentioned in this order and, owing to the fact that officers who take these courses do so voluntarily and without orders, the board considers it desirable to here set forth the various correspondence courses and the average number of officers enrolled in each, which are as follows:

Strategy and Tactics (regular officers)	520
Strategy and Tactics (reserve officers)	20
International Law	50
Advanced International Law	2

17. The board is of the opinion that these correspondence courses are of great value in the general scheme of instruction and training of line officers. In General Order 168 it is recommended that all officers endeavor to complete this course before reaching the grade of lieutenant commander. The board is of the opinion that the correspondence course in Strategy and Tactics is of even more importance to officers in the grades of lieutenant commander, commander, and captain, who have not had the regular Junior War College Course, and recommends that in the next revision of General Order 168 this recommendation be included.

General Line School and War College Facilities

18. With the increased number of officers detailed annually to take the War College Courses and the General Line Course, the space allotted for carrying out the work to the best advan-

tage has become inadequate. The Naval War College building is much more crowded than desirable, it being necessary to place as many as four officers in some of the rooms which, for best results, should not have more than two officers. The lecture room which, with the present curriculum, is used much more frequently than formerly, is inadequate in size and not suitable for the presentation of slides which has become an important factor in critiques and lectures since the War College was built. The board recommends that increased facilities be provided for the War College at the earliest practicable time.

The remainder of the porches of the Postgraduate School building are now being inclosed to provide for the increase in the next class. Upon completion of these alterations the capacity of the Postgraduate School will be limited to a maximum of 175 student officers of all groups including that of the General Line Course. Additions to the building must be made before this number of students can be increased.

CONCLUSIONS

19. The board is of the opinion that the system outlined above meets the present needs of the Navy in the progressive system of education of officers and recommends that in the future a board be ordered periodically to consider the general subject of the education of officers.